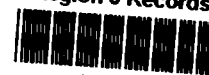


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FINAL DESIGN AND CONSTRUCTION QUALITY ASSURANCE PLAN

REVISION 1

MASTER METALS, INC. SITE

Cleveland, Ohio



PREPARED BY:

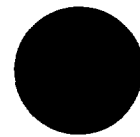


CONTACT

JANUARY, 2003

ENTACT

environmental tactics in waste management



1360 North Wood Dale Road

Suite A

Wood Dale, Illinois

60191

January 20, 2003

Ms. Gwen Massenburg
U.S. Environmental Protection Agency
Remedial Response Branch
77 W. Jackson Blvd. SR-6J
Chicago, IL 60604-3590

Re: January 2003 Final RD/RA Workplan and Final Design for the Master Metals Cleveland Site,
Cleveland, Ohio

Dear Gwen,

Enclosed are two copies of the Final RD/RA Workplan, Revision 1, the Final Design and Construction Quality Assurance Plan, Revision 1, for the Master Metals Site, Cleveland, Ohio. The reports have been revised to incorporate the latest round of USEPA and OEPA comments on the November 2002 Final RD/RA Workplan and November, 2002 Design documents and drawings. Also included are the Health & Safety Plan and the Draft Operation and Maintenance Plan, which is contained in Appendix E to the Final Design and Construction Quality Assurance Plan

Please feel free to call me at (630) 616-2100 if you have any questions.

Sincerely,

Patricia Vojack, P.G.
ENTACT & Associates LLC

Cc: Ms. Sheila Abraham, Ph.D, OEPA – 1 copy
Mr. Terry Casey, Efficasey Environmental LLC – 1 copy
Mr. Charles Bredt, NOLTCO – 1 copy



FINAL DESIGN
AND
CONSTRUCTION QUALITY ASSURANCE PLAN

FOR
THE MASTER METALS, INC. SITE
CLEVELAND, OHIO

Prepared by:

ENTACT & Associates LLC.
1360 North Wood Dale Road
Wood Dale, IL 60191

January 2003

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- 304 Aggregate Base
- 401 Plant Mix Pavements General
- 402 Asphalt Concrete
- 403 Asphalt Concrete
- 407 Tack Coat
- 623 Fence (includes (Chapter 358 City of Cleveland Fence Regulations)
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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order by Consent
ASTM	American Standards for Testing Materials
B&O	Baltimore and Ohio
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQA	Construction Quality Assurance
EE/CA	Engineering Evaluation and Cost Analysis
ENTACT	ENTACT & Associates LLC
FINDS	Facility Index System
FSAP	Field Sampling and Analysis Plan
HASP	Health and Safety Plan
mg/Kg	Milligrams /Kilogram
MMI	Master Metals, Inc
NEORS	Northeast Ohio Regional Sewer District
NL	National Lead
O&M	Operation and Maintenance
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RBRG	Risk-Based Remediation Goal
RD/RA	Remedial Design/ Remedial Action
SOW	Statement of Work
TCR	Time Critical Removal
USEPA	United States Environmental Protection Agency
XRF	X-Ray Fluorescence

1.0 INTRODUCTION

In accordance with the objectives set forth in the Administrative Order of Consent (AOC) and the Statement of Work (SOW), for the Master Metal, Inc. (MMI) Site in Cleveland, Ohio, ENTACT & Associates, LLC (ENTACT) has developed this Final Design and Construction Quality Assurance Plan (Plan). This Plan outlines the procedures and methodologies to be used for excavation, treatment, offsite disposal, backfilling, and grading excavated areas as required by the Removal Action at the MMI Site. The Construction Quality Assurance (CQA) part of this plan will ensure that the construction activities meet the substantive requirements as described in the SOW and discussed with the USEPA. This Plan will include the following topics:

- Introduction
- Design Analysis/Construction Quality Assurance
- Schedule
- Truck Route
- Specifications
- Drawings

This plan provides the drawings and specifications for excavation and offsite disposal of an anticipated volume of approximately 3,225 cubic yards, and procedures for backfilling those areas excavated as part of the remedial action. This volume is based on the assumption that impacted areas will be excavated to a depth of approximately one foot.

1.1 SITE LOCATIONS AND DESCRIPTION

The RD/RA Work Plan provides more comprehensive information about the site location and description. The information has been summarized in this section.

1.1.1 Site Location

The MMI Superfund Site (the "Site") covered under the AOC includes the former MMI lead facility (the "Facility") located at 2850 West Third Street, Cleveland, Cuyahoga County, Ohio. It also includes the stockpiled, treated soils removed from the residential properties at 1157, 1159 and 1167 Holmden Avenue (the "Holmden Properties") where lead-impacted material from Master Metals was deposited as fill (USEPA, 1997 and 1999, and ENTACT, 1998c). The Site is situated in Township 7 North, Range 12 West, Section 17, ¼ NE, ¼ SW, ¼ SW, with coordinates obtained from the Facility Index System (FINDS) listed as 41 degrees, 28 minutes, 26 seconds latitude and -81 degrees, 40 minutes, 31 seconds longitude. The site location is illustrated in Drawing 01.

1.1.2 Site Description

The MMI property is a triangular-shaped parcel encompassing approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The site is bordered on the west by rail yards owned by the Baltimore & Ohio (B&O) Railroad, the east by West Third Street and B&O railroad tracks, and on the south by a dead-end road and an abandoned industrial property. LTV Steel owns the property to the south and east.

The facility was constructed in 1932 on slag fill by National Lead Industries, Inc. (NL Industries) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. NL Industries also engaged in battery cracking operations at this facility. In 1979, the facility was purchased from NL Industries by MMI who continued to operate the secondary lead smelter (USEPA, 2001a).

1.2 PREVIOUS REMEDIATION ACTIVITIES

1.2.1 Phase I Time-Critical Removal Action

Major site features, prior to a 1997-1998 time-critical removal (TCR) action, included an office building, a secondary lead smelting furnace building, two large brick baghouses, the roundhouse building, storage buildings, material storage bins and boxes, and an aboveground storage tank farm. All buildings, except for the roundhouse and the attached office building in the northern corner of the property, were razed as part of the Phase I TCR. All remaining feedstock and debris materials were decontaminated and/or treated and disposed of off-site as either special waste or as hazardous waste (ENTACT, 1998a). The MMI facility property is currently vacant with the exception of the roundhouse, and the majority of the open land surface is covered with concrete or asphalt except along the site boundaries.

Stormwater drainage is directed toward one of five on-site stormwater catch basins that connect to the combined sewer system operated by the Northeast Ohio Regional Sewer District (NEORSD) (ESC, 1991). Current site features are shown in the drawings.

1.2.2 Phase II Engineering Evaluation and Cost Analysis

A Phase II EE/CA was conducted to develop an appropriate cleanup objective or Risk-Based Remediation Goal (RBRG) for the residual concentrations of lead remaining in soils at the MMI Site (ENTACT, 1998b).

Historical analytical data collected at the site between 1990 and 1998 were evaluated to determine the nature and extent of contamination at the site related to former site activities, and to identify where additional investigation was required to complete delineation of the facility-associated impacts. The historic slag fill, which pre-dates and

underlies the facility as well the majority of the surrounding area, contains elevated lead concentrations that are not related to former facility operations and therefore, not included in the removal actions for this site.

The EE/CA assessment verified that lead was the predominant hazardous constituent of concern at the site, with lesser occurrences of arsenic. Removal action directed at areas that exceed the RBRG for lead would also address the elevated levels of arsenic. An RBRG for lead of 1,000 mg/Kg was established for on-site and off-site perimeter soils (ENTACT, 1998b).

1.3 ADMINISTRATIVE ORDER BY CONSENT

Based on the findings of the Phase II EE/CA, an Action Memorandum was signed by the USEPA on September 22, 2000, and the Potentially Responsible Party (PRP) Respondent Group signed an Administrative Order by Consent (AOC) that became effective on September 25, 2002. As part of the negotiated AOC, the PRP group agreed to perform a non-time-critical removal action outlined in the Statement of Work (SOW) to address remaining lead impacts at the site that are associated with former facility operations. The SOW and AOC are presented in Appendix A of the Final RD/RA Workplan.

The AOC requires that material that exceeds the RBRG be excavated until historic slag is encountered. The excavated material will be treated and disposed offsite. Removal action tasks are described in detail in Section 2.0.

1.4 SUMMARY OF REMEDIAL DESIGN/REMEDIAL ACTION (RD/RA) WORK PLAN

The RD/RA Workplan includes a comprehensive description of the work to be performed, and a schedule for both the completion of each major activity and submission of each deliverable. This plan consists of six sections, summarized below:

Section 1: Introduction – Section 1 provides a comprehensive description of the Site, including the location and history.

Section 2: Project Organization and Management – Section 2 provides a description of the project team, project organization, and responsibilities.

Section 3: Scope of Work Tasks – Section 3 includes a description of the main three SOW tasks, including project plans, RD phases, and RA construction.

Section 4: Removal Action and Construction – Section 4 describes the major construction activities that will be implemented during the RA pursuant to the AOC and the SOW.

Section 5: Work Products and Reports – Section 5 describes and lists the reporting requirements during the implementation and at the completion of the RA.

Section 6: Project Schedule – Section 6 presents the project schedule which includes a schedule of completion for each required major activity and submission of each major deliverable.

The following plans, which are referenced by this Pre-Final Design, are appendices to the RD/RA Work Plan:

- Performance Standard Verification Plan
- Field Sampling and Analysis Plan (FSAP)
- Quality Assurance Project Plan (QAPP)
- Treatability Study Report
- Erosion Control Plan
- Community Relations Plan

1.5 BASIS OF DESIGN

1.5.1 Excavation, Treatment, Offsite Disposal

The volume of impacted soil includes material from the offsite perimeter areas; the onsite areas where additional excavation is required; and the treated Holmden Avenue stockpile that is presently onsite. Calculations are presented in Appendix B.

CADD software was used to calculate the areas of impacted soil. The volume of onsite and offsite impacted soil was estimated to be approximately 3,144 cubic yards, assuming excavations are made to an average depth of one foot.

The estimated volume of soil in the onsite Holmden Avenue stockpile is based on the April 5, 2000 and October, 2001 surveys prepared by Campbell & Associates, Inc. The estimated volume of this soil pile is approximately 930 cubic yards.

Following verification testing to ensure the material has been rendered nonhazardous: the stabilized soils will be used to fill pits and low areas in the southern part of the property to be covered with asphalt. Excess treated soils will be disposed of offsite.

1.5.2 Refurbishment of Concrete Surface

The existing concrete surface will be refurbished to serve as a cover to the underlying lead-impacted historic slag fill. The condition of the concrete surface near the area of the Holmden Avenue soil stockpile and former tank mounts is presently unknown. The concrete surface may need extensive repair. Sampling, excavating and backfilling may be required as appropriate

1.5.3 Asphalt Cover

A minimum 4-inch asphalt layer will be installed over approximately 81,700 square feet.

2.0 DESIGN ANALYSIS

The following design analysis references plans presented in the RD/RA Work Plan and the ODOT specifications. Payment for the remedial action will be on a lump sum basis. Therefore, all references to payment or measurement of completed work in the Ohio Department of Transportation (ODOT) specifications are not applicable.

2.1 AIR MONITORING

Air monitoring includes perimeter air monitoring and personal air monitoring. Perimeter air monitoring shall be performed as described in the FSAP (Appendix C of the RD/RA Work Plan), and personal air monitoring shall be performed according to requirements of the Health and Safety Plan (HASP). Performance standards for air monitoring activities are in the Performance Standard Verification Plan presented in Appendix B of the RD/RA Work Plan.

2.2 EROSION CONTROL/ STORMWATER CONTROL

Erosion control and stormwater control shall be conducted according to the Erosion Control Plan in Appendix F of the RD/RA Work Plan. As indicated in the Erosion Control Plan, existing sewer manholes that could not be opened during the sewer survey and labeled as "could not open" on the design drawings will be opened and inspected as part of the removal action.

2.3 MONITORING WELL ABANDONMENT

The four shallow monitoring wells shown on Drawing 03 shall be abandoned in accordance with Ohio Administrative Code (OAC) 3701-28-07; the 1996 State of Ohio Technical Guidance for Sealing Unused Wells; and Ohio EPA's Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, June 1993, Chapter 9. This includes overdrilling the well to remove the annular seal and filter pack and then pressure grouting the borehole using a tremie pipe as the drilling stem is removed.

Four shallow monitoring wells were installed at the site in the unconsolidated material to a depth of 15 feet below grade (CTI, 1991). Only three of the four shallow monitoring wells were located during a well location survey performed as part of the EE/CA investigation in 1997.

Efforts will be made to extract the well riser and screen, if technically feasible, in accordance with the preferred state methodology. The boring should be over drilled to

remove the annular seal and filter pack. The borehole should be pressure grouted using a tremie pipe as the drilling stem is removed.

However, since the monitoring wells were installed as flush mounts through the existing concrete, removal of the riser and screen may not be feasible. If efforts to remove the screen and riser are not feasible, the wells will be backfilled with clean sand to one foot above the top of the screen (9 feet below grade). A one-foot layer of bentonite pellets will then be placed above the sand, either through a tremie pipe and tamped down to ensure there is no bridging, and hydrated. The remaining annular space shall be pressure-grouted on one continuous motion from the bottom up, using a tremie pipe. The casing shall be cut off flush with the concrete surface, and the concrete surface repaired with epoxy or cement and encapsulated. In accordance with Ohio Revised Code (ORC) 1521.05(B), a well sealing report shall be filed with the Ohio Department of Natural Resources (ODNR) on forms supplied by the Department.

2.4 CLEARING & GRUBBING

The excavation areas will be cleared and grubbed to grade and disposed of off-site in accordance with the requirements of the SOW. Work shall be performed in general accordance with ODOT Specification 201.

2.5 ABANDON FORMER SUMPS

The former sumps (concrete pits) to be abandoned are shown on Drawing 03. These sumps were not connected to the stormwater or sewer lines and were cleaned of any residual sediment as part of the Phase I TCR. All former sumps not backfilled during the Phase I TCR will be filled with stabilized materials prior to placement of the asphalt cover. The sumps shall be abandoned in general accordance with ODOT Specification 202.09.

2.6 CLEAN AND DISPOSE OF DRUMS & CONTENTS

All on-site drums remaining from previous removal actions or investigations will be opened, characterized, stabilized if necessary, and disposed of at the approved landfill. The empty drums will then be decontaminated using a steam-cleaner or pressure washer for possible recycling or disposal along with the construction debris from demolition of existing concrete and wood structures. Waste material generated during clearing and removal activities (i.e. personal protective equipment (PPE), concrete debris, etc.) will be disposed of off-site at an approved landfill. Any material designated for recycling will be transported to the designated decontamination area and steam-cleaned or pressure-washed to remove any surface lead before leaving the site. All decontamination rinse water will be collected and pumped into temporary holding tanks. All wastewater will be sampled and disposed of in accordance with the RD/RA Workplan. Potable water or storm water will be used for dust suppression in areas requiring excavation.

2.7 FENCE REMOVAL

The existing fence, as shown on Drawing 03 shall be dismantled and disposed of offsite. The fence shall be removed from an area when that area is under construction. During construction in each working area, a temporary fence shall be installed in areas where the existing fence has been removed for construction to maintain security (Section 2.8). Once construction is completed, a new fence shall be installed (Section 2.19).

2.8 INSTALLATION OF TEMPORARY CONSTRUCTION FENCE

In accordance with the requirements of the SOW, a temporary fence will be installed during remediation activities to maintain security during removal activities. The temporary fence shall incorporate existing fencing as much as possible and be a minimum of six feet high.

2.9 DEMOLITION /OFFSITE DISPOSAL

Contractor shall demolish the existing concrete and metal structures, including partial walls, stalls and other above-grade structures as shown on Drawing 03, as well as other irregularities that would inhibit a sound structural bonding of a new asphalt bonding. The concrete debris shall either be sized and used as subgrade material in low areas beneath the asphalt cover or will be disposed off-site. All other demolition debris will be disposed of off-site as construction debris.

2.10 EXCAVATION

On-property soils not covered with concrete or the proposed asphalt cover, and off-property perimeter soils along the eastern, western and southern boundaries of the property will be excavated until either the RBRG of 1,000 mg/Kg is reached or until historic slag fill is encountered, whichever comes first. On-property and off-property areas to be excavated are shown in Drawing 05. The excavation will proceed in a manner so as to minimize traffic over areas where remedial action has occurred.

Performance standards for excavation and X-Ray Fluorescence (XRF) field screening activities are in the Performance Standard Verification Plan (PSVP) presented in Appendix B of the RD/RA Work Plan.

Two feet of clean sand fill was used as backfill in the onsite areas. The clean sand fill will be removed and stockpiled; the onsite areas under the fill will be excavated until either the RBRG of 1000 mg/Kg is reached or until historic slag fill is encountered; and the clean fill will be re-used either in areas beneath the asphalt cover or in areas outside the concrete or asphalt cover following analytical testing.

The eastern and southern perimeter areas extend to the curb of West Third Street. The western perimeter areas extend to where there is visual evidence of the divide between

the manufacturing operations of the Master Metals facility and the eastern edge of the adjoining railroad access way as designated in Drawing 05.

Excavation will be guided by the use of an XRF field-screening instrument and will be terminated either when the performance criteria are achieved or the historic slag is encountered. The XRF instrument will analyze for total lead. For any grids where excavation is terminated prior to reaching the historic slag fill, the achievement of the performance criteria utilizing the XRF will be verified by the collection of a confirmatory sample. Once the performance criteria have been met, or when historic slag fill is visually encountered, the grid will be considered successfully excavated and backfilled with clean fill material. XRF field screening and post-excavation confirmatory sampling are described in the FSAP, which is in Appendix C of the RD/RA Work Plan. Performance standards for post-excavation sampling are in the Performance Standard Verification Plan presented in Appendix B of the RD/RA Work Plan.

2.11 TREATMENT OF SOILS

Excavated soils exceeding the 1,000 mg/Kg lead criterion will be consolidated and staged for treatment in a treatment staging area. A detailed discussion of the treatment system and additives used is provided in Appendix E of the RD/RA Work Plan. The treated soils will then be staged in the post-treatment staging area for verification sampling prior to shipment to an offsite disposal facility. Performance standards for treatment of soils are in the Performance Standard Verification Plan presented in Appendix B of the RD/RA Work Plan.

2.12 BACKFILLING AND SITE RESTORATION

All excavated areas outside the proposed asphalt cover will be backfilled to final grade with clean, suitable fill, including a minimum of six inches of topsoil suitable to support vegetative growth. The western portion of the site will be filled with suitable soils to maintain the current vegetation within the low-lying ditch area. The on-site fill be graded to promote positive drainage toward the existing catch basins and sewers since no impacted soils will remain exposed either on the property or the off-property perimeter areas. Off-property filled areas will be graded to maintain current drainage patterns.

Imported fill brought on-site from outside sources will be sampled and analyzed in accordance with the FSAP and QAPP to verify that the off-site fill materials are acceptable. The sampling will be performed by ENTACT who will provide the necessary documentation that the material meets the Agencies' criteria.

The FSAP and the QAPP (Appendix C and D of the RD/RA Work Plan) provide details on the sampling requirements and procedures for the backfill characterization. Performance standards for backfill activities are in the Performance Standard Verification Plan presented in Appendix B of the RD/RA Work Plan. Material testing methods are in Table 1.

Placement of backfill shall be in general accordance with ODOT specification 203. Furnishing and placement of topsoil shall be in general accordance with ODOT specification 653, and seeding and mulching shall be in general accordance with ODOT specification 659.

2.13 ASPHALT

A 1.25-inch surface course and a 2.75-inch base course of aggregate and asphalt cement shall be placed on the concrete, in the asphalt placement area as shown in Drawing 05, in general accordance with ODOT Specifications 401, 402, 404 and 407. In all areas off the existing concrete pad that are under the proposed asphalt cover, the asphalt cover shall be underlain by a base course layer adequate to support the intended vehicle traffic, in general accordance with ODOT Specification 400. Material testing methods are presented in Table 1.

Geotextile will be used only in areas where depressions are filled. The fabric will be placed over the filled depressions and overlapped 5 feet on the surrounding surface to achieve structural stability.

Prior to hot mix asphalt installation, the designated edge of the asphalt will be surveyed. The existing concrete adjacent to this edge will be planed with a PR450 road planer or equivalent to an approximate depth of 1-1/2 to 2 inches and approximately 4 to 6 feet in width. This edge will be sealed using ODOT-quality crack fill/sealer.

2.14 REFURBISHMENT OF CONCRETE SURFACE

The existing concrete layer that has not been covered with asphalt will be inspected to ensure that the integrity of the concrete is intact for future land reuse. Areas with significant cracks (i.e., fully penetrating the existing concrete surface with a width greater than one-half inch) or deterioration will be repaired in general accordance with ODOT Specification 256 followed by encapsulation of the concrete surface using a patented process (*Surtreat*TM).

The *Surtreat*TM Total Performance System (TPS) is a proprietary concrete restoration and protection system that includes sequential application of chemical treatments to improve the properties of the deteriorating concrete and protect new structures. The proprietary chemical formulations penetrate into the concrete microstructure in liquid and vapor state to combine with the cement phase of concrete and deposit on steel components. This acts to increase the ability of concrete to resist deterioration by increasing compressive strength, reducing permeability, inhibiting corrosion of the reinforcing steel components and improving concrete's resistance to acid attack. Technical Data Sheets and Material Data Safety Sheets for the *Surtreat*TM Total Performance System are presented in Appendix C.

2.15 FENCE INSTALLATION

A new fence shall be furnished and installed in general accordance with ODOT Specification 607. The fence shall be an industrial grade fence, six feet high and topped with three strands of barbed wire. Three gates will be constructed in locations shown on Drawing 03. The gates will be double swing gates with the exception of the gate by the entrance area. This gate will be upgraded, at new Owner expense, to a sliding gate with Card Key Access capabilities.

2.16 SURVEY

A topographical survey of the entire site shall be performed at the conclusion of the project to document as-built site conditions. A land surveyor registered in the State of Ohio shall perform the survey.

2.17 OFFSITE DISPOSAL OF CONTAMINATED SOIL

Performance standards for transportation and offsite disposal activities are in the Performance Standard Verification Plan presented in Appendix B of the RD/RA Work Plan.

3.0 PROJECT SCHEDULE

The construction schedule for remediation activities at the Master Metals, Inc., site in Cleveland, Ohio, is presented in Appendix D.

4.0 REFERENCES

Compliance Technologies, Inc. (CTI), January 17, 1991. *Groundwater Analyses Report for Master Metals, Inc., Cleveland, Ohio*

Ecology & Environment (E&E), August, 1992. *Site Assessment Report for the Master Metals, Inc. Site, Cleveland, Cuyahoga County, Ohio*. Prepared for Duane Heaton, Deputy Project Officer, Emergency Support Section, EPA Region 5.

ENTACT, Inc. (ENTACT), November 23, 1998b. Phase II Engineering Evaluation and Cost Analysis (EE/CA) Report for the Master Metals Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Master Metals PRP Group in Response to the April 17, 1997 Administrative Order by Consent Pursuant to Section 106 of CERCLA issued by the USEPA.

ENTACT, April 24, 1998a. Phase I Final Report for Time-Critical Removal Action at the Master Metals Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Master Metals PRP Group in Response to the April 17, 1997 Administrative Order by Consent Pursuant to Section 106 of CERCLA issued by the USEPA.

ENTACT, Inc. (ENTACT), February 6, 1998c. Final Report for Removal Activities at the Holmden Avenue Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Holmden Avenue PRP Respondent Group .

Environmental Strategies Corporation (ESC), February 15, 1991. Environmental Risk Assessment Final Report, Master Metals Site, Cleveland, Ohio. Prepared for Master Metals, Inc.

United States Environmental Protection Agency, September 25, 2002. *Administrative Order by Consent Pursuant to Section 106 of CERCLA of 1980 -Master Metal Superfund Site, Cleveland, Ohio*, Docket No. V-W-'02-C-711.

USEPA. 2002. *Statement of Work (SOW) for the Design/Construction and Cleanup at the Master Metals Superfund Site, Cleveland, Cuyahoga County, Ohio*.

USEPA. March, 1999. *U.S.EPA Proposes Clean-up Plan for Master Metals Site, Cleveland, Ohio*. Office of Public Affairs, Region 5. Chicago, Illinois.

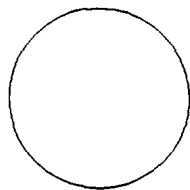
TABLES

Table 1.
Material Testing Methods and Frequency

Test Description	Test Number	Testing Frequency/ Tolerance
Treated Material:		
Standard Proctor Test	ASTM D1557	1 test
In-situ Density	ASTM D2922	5 tests over placement area per 8-inch lift
Thickness		Tolerance shall be within +/- 0.5 inch
Asphalt Cover:		
Maximum Theoretical Density		Obtained from batch plant
In-situ Density	ASTM D2950	5 for base course and 5 for surface course.
Thickness		Measure after base course, and after surface course. Tolerance shall be within +/- 0.5 inch
Backfill for Excavations:		
Standard Proctor Test	ASTM D1557	1 test
In-Situ Density	ASTM D2922	2 tests per 8-inch lift over placement area
Top Soil:		
Organic Content Determination	ASTM D2974	1 test
Washed Sieve Analysis	ASTM D422	1 test

DRAWINGS

- 01 COVER SHEET**
- 02 TOPOGRAPHICAL SURVEY**
- 03 SITE DEMOLITION PLAN AND FENCE REPLACEMENT**
- 04 SITE EXCAVATION AND BACKFILL PLAN**
- 05 CONCRETE REFURBISHMENT PLAN**



ENTACT & ASSOCIATES, L.L.C.

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MARK - BM

POWER POLE No. 523044, 2.0' EAST OF
CURB ON WEST 3rd STREET

↓ = 592.60



SCALE: 1"=30'

DESIGNATION	SIZE	HEIGHT
F.C.B.	1.5'X1.5'	0.4'
F.C.B.	1.5'X1.5'	0.4'
F.C.B.	1.5'X1.5'	0.4'
F.C.B.	1.5'X1.5'	0.3'
F.C.B.	1.5'X1.5'	0.25'
F.C.B.	1.5'X1.5'	0.2'
F.C.B.	1.5'X1.5'	0.35'
F.C.B.	1.5'X1.5'	0.1'
F.C.B.	1.5'X1.5'	0.1'
F.C.B.	1.5'X1.5'	0.9'
F.C.B.	1.6'X1.6'	0.6'

LEGEND

REC. - RECORD DISTANCE
OR ANGLE
CAL. - CALCULATED DISTANCE
OR ANGLE
OBS. - OBSERVED DISTANCE
OR ANGLE
T.P.O.B. - TRUE PLACE OF
BEGINNING
P.O.B. - PLACE OF BEGINNING

MASTER METAL, INC. SITE
SITE REMEDIATION
CLEVELAND, OHIO

TOPOGRAPHICAL SURVEY
MAP

DATE

JUNE 25 2001

PROJECT NO.

SITE REMEDIATION

FILENAME

C02-010803.dwg

SHEET NO.

2 OF 5

DRAWING NO.

02



SCALE: 1"=30'

- BM

OLE No. 523044, 2.0' EAST OF
1 WEST 3rd STREET

0

LEGEND



MONITORING WELLS TO BE ABANDONED
IN ACCORDANCE WITH OAC 3701-28-07
AND 1996 STATE OF OHIO TECHNICAL
GUIDANCE FOR SEALING UNUSED WELLS.

REC. - RECORD DISTANCE
OR ANGLE

CAL. - CALCULATED DISTANCE
OR ANGLE

ION	SIZE	HEIGHT
	1.5'x1.5'	0.4'
	1.5'x1.5'	0.4'
	1.5'x1.5'	0.4'
	1.5'x1.5'	0.3'
	1.5'x1.5'	0.25'
	1.5'x1.5'	0.2'

MASTER METAL, INC. SITE
SITE REMEDIATION
CLEVELAND, OHIO

SITE DEMOLITION PLAN
AND FENCE REPLACEMENT PLAN

DATE

JUNE 25 2001

PROJECT NO.

SITE REMEDIATION

FILENAME

C03-010803.dwg

SHEET NO.

3 OF 5

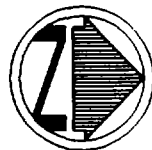
DRAWING NO.

03

ALL BE SAMPLED AND
ACCEPTABLE. THE
PLACEMENT.
DETAILS ON
FILL CHARACTERIZATION.
PERFORMANCE STANDARD
WORK PLAN. MATERIAL

SPECIFICATION 203.
INCE WITH ODOT
ACCORDANCE WITH

BACKFILL IN THE AREAS
AND STOCKPILED FOR
ID AND ANALYZED



SCALE: 1"=40'

BENCH MARK - BM

SPIKE IN POWER POLE No. 523044, 2.0' EAST OF
EASTERLY CURB ON WEST 3rd STREET

ELEVATION = 592.60

MASTER METAL, INC. SITE
SITE REMEDIATION
CLEVELAND, OHIO

SITE EXCAVATION AND
BACKFILL PLAN

DATE

JUNE 25 2001

PROJECT NO.

SITE REMEDIATION

FILENAME

C04-010803.dwg

SHEET NO.

4 OF 5

DRAWING NO.

04



SCALE: 1"=40'

LEGEND.
PARTS INCH
STRUCTURED ON
ACCORDANCE
ODS ARE
ICE PLAN.

1/4" = 1'

HALT COVER
TE IS INTACT
INTRATING THE
OR DETERIORATION,
Y OR CONCRETE
PROCESS
PAIR PROCESS

BENCH MARK - BM

SPIKE IN POWER POLE No. 523044, 2.0' EAST OF
EASTERLY CURB ON WEST 3rd STREET

ELEVATION = 592.60

LEGEND

MASTER METAL, INC. SITE
SITE REMEDIATION
CLEVELAND, OHIO

CONCRETE REFURBISHMENT PLAN
AND ASPHALT PLAN

DATE

JUNE 25 2001

PROJECT NO.

SITE REMEDIATION

FILENAME

C05-010803.dwg

SHEET NO.

5 OF 5

DRAWING NO.

05

ODOT SPECIFICATIONS

The design analysis refers to ODOT specifications that are provided in this section. Payment for the remedial action will be on a lump sum basis. Therefore, all references to payment in the ODOT specifications are not applicable.

200 EARTHWORK

ITEM 201 CLEARING AND GRUBBING

201.01 Description

201.02 General

201.03 Clearing and Grubbing

201.04 Scalping

201.05 Method of Measurement

201.06 Basis of Payment

201.01 Description. This work shall consist of clearing, grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris within the limits of the right-of-way and easement area, except such objects that are to remain or are to be removed in accordance with other sections of these specifications. When the bid schedule contains a lump sum for 201 Clearing and Grubbing, the lump sum price bid will be paid and shall be full compensation for all the work described in this section, including removal of all trees and stumps marked for removal. When the bid schedule contains 201 Removal of Trees and Stumps on an individual basis, the balance of the work described in this section shall be performed but will not be paid for directly, but shall be considered as a subsidiary obligation of the Contractor under other contract items.

201.02 General. The Engineer shall exercise control over clearing and grubbing and shall designate all trees, shrubs, plants, and other objects to be removed. This work shall also include the preservation from injury or defacement of all vegetation and objects to remain. Paint required for cut or scarred surfaces of trees or shrubs selected for retention shall be a suitable asphaltum base paint.

Before the Contractor removes any tree or stump which the plans state is to be removed, the Engineer shall review the plan requirements and appropriately mark each tree or stump which is to be removed.

Only such trees and stumps which have been marked for removal by the Engineer shall be removed.

Limitations of areas of clearing and grubbing and earthwork operations shall be in accordance with 108.04 and 207.

201.03 Clearing and Grubbing. All surface objects, brush, roots, and other protruding obstructions, not designated to remain, and all trees and stumps marked for removal, shall be cleared and/or grubbed, including mowing, as required, except for special treatment as follows:

(a) In locations to be seeded, stumps shall be removed to a minimum of 150 mm (6 inches) below ground surface.

(b) In unseeded areas to be rounded at the top of backslopes, stumps shall be cut off flush with or below the surface of the final slope line.

(c) In locations which will be a minimum of 1 m (3 feet) below subgrade or slope of embankment, the Contractor may leave undisturbed stumps and roots and nonperishable solid objects provided they do not extend more than 150 mm (6 inches) above the ground surface.

(d) In locations outside of the construction limits of cut and embankment areas not to be seeded, sound stumps may be allowed to remain provided they do not extend more than 0.6 m (24 inches) above the ground surface.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be backfilled with suitable material and compacted in accordance with 203.10.

Materials and debris may be removed from the right-of-way and disposed of at locations off the project outside the limits of view from the right-of-way with the written permission of the property owner on whose property the materials and debris are placed. The Contractor shall make all necessary arrangements with property owners for obtaining suitable disposal locations and the cost involved shall be included in the unit price bid.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 6 m (20 feet) above the roadbed surface.

201.04 Scalping. The Contractor shall scalp areas where excavation or embankment is to be made, except that areas need not be scalped where the embankment to be constructed is 1.2 m (4 feet) or more in height to subgrade elevation. Scalping shall include the removal of material such as roots, sod, grass, residue of agricultural crops, sawdust, and decayed vegetable matter from the surface of the ground.

Shoulder areas on resurfacing and widening and resurfacing projects which do not support new pavement and do not involve new ditch construction shall be cleared of weeds and brush but need not be scalped prior to placement of embankment required to build up the shoulder.

Sod and incidental topsoil removed in the scalping operation shall be salvaged and stockpiled for use as specified in 203.04(e). The stockpiles of scalpings shall be made in such a manner and at such locations that they will be well drained and will not impound water.

The depth of scalping performed under this section is not intended to include topsoil. Additional depth of material which is required to be moved over and above scalping operations as described in this section shall be measured and paid for at the contract unit price bid per cubic meter (cubic yard) for 203.

201.05 Method of Measurement. Measurement will be by one of the following alternate methods:

(a) Lump Sum Basis. When the bid schedule contains a clearing and grubbing lump sum item, no measurement of area will be made.

(b) Individual Unit Basis. The diameter of trees will be measured at a height of 1.4 m (54 inches) above the ground. Trees 0.3 m (12 inches) and less in diameter will be classed as brush. Stumps will be measured by taking the average diameter at the cutoff. When the bid schedule indicates measurement by individual unit basis, trees or stumps will be designated and measured in accordance with the following schedule of sizes:

Diameter	Pay Item Designation
Over 0.3 m to 0.6 m	0.5 m size each
Over 0.6 m to 0.9 m	0.8 m size each
Over 0.9 m to 1.5 m	1.2 m size each
Over 1.5 m	1.5 m size each
Over 12 inches to 24 inches	15-inch size each
Over 24 inches to 36 inches	30-inch size each
Over 36 inches to 60 inches	48-inch size each
Over 60 inches	60-inch size each

201.06 Basis of Payment. The accepted quantities will be paid for at the contract unit prices as follows:

Item	Unit	Description
201	Lump sum	Clearing and grubbing
201	Each	Trees or stumps removed, ____ size

ITEM 202 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

202.01 Description

202.02 Construction Requirements

202.03 Bridges, Culverts and Other Drainage Structures Removed

202.04 Pipe Removed

202.05 Pavement, Walks, Curbs, etc., Removed

202.06 Buildings Demolished

202.061 Septic Tanks, and Privy Vaults Removed

202.062 Underground Storage Tanks Removed

202.07 Guardrail and Fence Removed

202.071 Raised Pavement Markers Removed

202.08 Manhole Catch Basin and Inlet Removed

202.09 Manhole, Catch Basin and Inlet Abandoned

202.10 Method of Measurement

202.11 Basis of Payment

202.01 Description. This work shall consist of the removal, wholly or in part, and satisfactory disposal of all buildings, fences, guardrails, structures, old pavements, abandoned pipe lines, storage tanks, septic tanks, privy vaults, and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the contract. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes, and pits. When specific pay items are not listed on the plans for removal of structures and obstructions as set forth in this section, such work shall be performed under 203 Roadway Excavation and Embankment.

202.02 Construction Requirements. The Contractor shall raze, remove, and dispose of all buildings and foundations, structures, fences, guardrails, old pavements, abandoned pipe lines, storage tanks, septic tanks, privy vaults, and other obstructions any portion of which are on the right-of-way, except utilities and those items for which other provisions have been made for removal. All designated salvageable materials shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored by the Contractor at specified places within the project limits. Unusable material shall be destroyed or disposed of outside the limits of view from the right-of-way with written permission of the property owner on whose property the material is placed. Copies of all agreements with property owners shall be furnished to the Engineer. Basements or cavities left by structure removal shall be filled to the level of the surrounding ground, and if within the area of construction, shall be compacted in accordance with 203.

When existing sewers are encountered in removal operations and are determined by the Engineer to be inactive or are to be abandoned, they shall be plugged or sealed at the ends where broken into before backfilling operations proceed. Plugging and sealing shall be accomplished by furnishing and placing approved precast stoppers or masonry bulkheads.

202.03 Bridges, Culverts and Other Drainage Structures Removed. Bridges, culverts, and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic.

The substructures of existing structures, including piling, shall be removed down to the proposed stream bottom and those parts outside the stream shall be removed to a minimum of 0.3 m (1 foot) below proposed ground surface. Where such portions of existing structures lie wholly or in part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

When specified, all structural steel, timber, and other reusable materials shall be carefully dismantled, and when specified, steel members shall be match marked as directed by the Engineer. Specified salvaged materials shall be considered as the property of the state and such materials shall be stored as specified in 202.02. Where alteration of an existing structure requires removal of portions of the structure, such removal shall be performed with sufficient care as to leave the remaining portion of the structure undamaged. In case of damage to the existing structure, repair or replacement shall be made at the Contractor's expense and to the approval of the Engineer.

202.04 Pipe Removed. This section provides for "Pipe removed for reuse or storage" and "Pipe removed." For both types of removal, the work under this section shall include excavating all material necessary to permit removing the pipe; disposing of excavated material, including broken pipe; sealing openings left in walls of manholes or catch basins that are to remain in place; and removing and disposing of pipe headwalls.

(a) For "Pipe removed for re-use or storage," the work shall include removing, cleaning when re-used, transporting, and storing the pipe. All pipe shall be carefully removed and every precaution taken to avoid breaking or damaging the pipe. Pipe to be relaid shall be removed and stored when necessary, so that there will be no loss or damage before relaying. The Contractor will be required to replace sections lost from storage or damaged by negligence or by use of improper methods at no additional cost to the State.

(b) For "Pipe removed," the pipe becomes the property of the Contractor and shall be disposed of in accordance with 202.02.

(c) Excavating. Where the plans call for pipe to be removed for re-use or storage, a section of pipe line shall be removed sufficient in length to permit determining the quality of pipe and the possibility of removing it without damage. If the Engineer determines that the pipe is worth salvaging and can be salvaged, the Contractor shall perform the remainder of the excavation in a manner that will not damage the pipe. If the Engineer determines otherwise, the pipe shall be removed under "Pipe removed," and the original item shall be non-performed.

Where caving occurs, the caved material shall be excavated before the trench is backfilled.

All excavated material shall be used or disposed of in accordance with the provisions of 203.

(d) Backfill. The trench resulting from the removal of pipe shall be backfilled in accordance with the provisions of 203 except when the trench lies within the limits of subsequent excavation. Any trench resulting from pipe removal under proposed pavement or paved shoulder shall be backfilled in accordance with the requirements of 603.08 for backfilling conduit Type A or B.

202.05 Pavement, Walks, Curbs etc. Removed. When designated for removal, an existing wearing course, concrete base course, concrete pavement, bituminous wearing course on brick and/or concrete base, concrete, walks, concrete steps, concrete gutters, stone or concrete curbs, concrete traffic dividers, etc., shall be removed and disposed of as follows:

(a) Materials to be salvaged shall be carefully removed and stored on the right-of-way at locations determined by the Engineer.

(b) Materials that are not to be salvaged or that are not suitable for re-use shall be disposed of in the same manner as excavation, 203.05.

(c) Where only a portion of an existing walk, pavement, etc. is to be removed, a neat joint shall be sawed or otherwise cut at the removal limit if it does not occur at an existing joint.

202.06 Buildings Demolished. Buildings and appurtenances designated for demolition shall not be disturbed by the Contractor until he has been furnished with Notice of Possession and Approval to Proceed by the Engineer. As soon as such approval has been given, the Contractor shall schedule and perform the demolition, under the direction of the Engineer, in a manner that will accommodate utility rearrangements and clearance of structures. Buildings designated for demolition which are located partially or totally on temporary right-of-way shall be demolished in their entirety as directed by the Engineer, and the backfill and related work shall be done the same as if they were in the permanent right-of-way. If the Contractor desires to use buildings located partially on and partially off permanent right-of-way for storage, office, living quarters, or other purposes, a copy of a written agreement between the Contractor and the property owner shall be furnished to the Engineer allowing such use during the period of the contract and saving the State harmless from any claims whatsoever by reason of such use.

Foundations, floors, floor slabs, and basement, pit, well and cistern walls shall be removed to a minimum of 0.3 m (1 foot) below the grade of the surrounding area.

Tanks shall be completely removed and basements shall be cleared of all debris, appliances, wood or metal partitions, wood floors, etc., so that only masonry walls and concrete basement floors remain. All floor slabs, under which a pit, well, cistern or tank exists shall be broken and removed. Basement floors which are left in place shall be broken and all drains that are not removed shall be sealed with masonry or with precast clay or concrete stoppers.

All material except that belonging to a public or private utility company shall become the property of the Contractor. The Contractor shall notify the owners of water, electric, or gas meters when the meters are ready for removal, and shall be responsible for disconnecting all utilities in compliance with local requirements.

As soon as demolition work has been otherwise completed and approved by the Engineer, filling shall be performed as described in 202.02. The final grade of backfill in areas outside the prism of construction shall be such as to present a neat, well-drained appearance, and to prevent water from draining unnecessarily onto adjacent properties.

202.061 Septic Tanks and Privy Vaults Removed. Septic tanks and privy vaults located within the proposed right-of-way limits shall be emptied and the removed contents disposed of in accordance with 202.02 in a manner that will comply with requirements of the State and Local Boards of Health or other authorities having jurisdiction.

Septic tanks and privy vaults located above the subgrade or finished ground lines shall be removed and disposed of. When septic tanks and privy vaults are located below the subgrade or finished ground lines, tops and walls shall be removed to a minimum depth of 0.3 m (1 foot) below these lines. floors shall be broken, and drains that are not

removed shall be sealed with masonry or with precast clay or concrete stoppers. Backfilling shall be in accordance with 202.02.

202.062 Underground Storage Tank Removed. Underground storage tanks designated in the contract shall be removed in a manner that shall comply with requirements set forth by the authorities having jurisdiction. Underground storage tanks regulated by the Bureau of Underground Storage Tank Regulations of the Division of Fire Marshal (BUSTR) shall be removed in accordance with rules set forth by BUSTR and all other applicable local, State and Federal regulations. This work shall include, but not be limited to, obtaining the required permit to remove; disposing of the underground storage tank and its contents; testing the excavated material; and preparing the closure report. This work shall be performed under the direction of a Certified Tank Installer provided by the Contractor. Underground storage tanks exempt from BUSTR but regulated by the State Fire Marshal shall be removed in accordance with rules set forth by the State Fire Marshal and all other applicable local, State and Federal regulations. Underground storage tanks containing hazardous substances other than petroleum may involve Ohio Environmental Protection Agency regulations in addition to State Fire Marshal regulations. All of the costs and work associated with compliance of the aforementioned rules or regulations shall be included in the unit bid price for Regulated Underground Storage Tank Removed. Underground storage tanks and contents shall be removed in their entirety, and shall become the property of the Contractor and be disposed of by him. If any contaminated water or soil disposal or remediation is required as a result of the underground storage tank removal, then these items of work shall be handled under other items in the contract or by 109.04. Backfilling shall be in accordance with 202.02.

202.07 Guardrail and Fence Removed. Where designated, existing guardrail (including anchor assemblies and terminal assemblies, and any attached posts, signs, and delineators) and fence shall be carefully dismantled and stored for re-use as specified or for salvage by the State. Wood posts and other materials not considered salvageable shall be disposed of in accordance with 202.02.

For projects where fence is to be removed and replaced, no fence shall be removed until replacement material is on site. New installation shall start within 2 working days of the removal process.

202.071 Raised Pavement Markers Removed. Where designated, existing raised pavement markers shall be removed in a manner which will prevent damage to the castings. All depressions caused by removal of the castings shall be filled by the next working day. Any standing water shall be removed from the hole prior to filling. The bituminous concrete used for filling the hole shall be compacted and left flush with the pavement. Removed markers shall be stored on the project for salvage by the State.

202.08 Manhole, Catch Basin, and Inlet Removed. Existing drainage structures of these types designated for removal shall be removed under this item. Areas under the pavement or paved shoulder shall be backfilled as per 603.08 for Type A or B conduit.

Castings shall become the property of the Contractor unless otherwise noted on the plans.

202.09 Manhole, Catch Basin, and Inlet Abandoned. Existing drainage structures of these types which are designated to be abandoned shall be removed to a minimum of 0.3 m (1 foot) below the finished subgrade or ground surface in a manner that will not damage pipes that are to remain.

When directed, existing pipes shall be connected through the structures with new pipe of a type and in a manner acceptable to the Engineer, without additional cost to the State.

When directed, existing inlet and outlet pipes shall be sealed with precast vitrified or concrete stoppers or with masonry of a type and thickness acceptable to the Engineer.

After connecting across or sealing the existing pipes and removing walls to the required depth, remaining cavities shall be backfilled as required under 202.08. When connecting pipes are used, suitable backfill shall be carefully tamped solidly under and around the pipe.

Castings shall become the property of the Contractor unless otherwise noted on the plans.

202.10 Method of Measurement. When the contract stipulates that payment will be made for removal of obstructions on a "lump sum" basis, the pay item will include all structures or obstructions encountered at locations or within areas designated on the plans or in the proposal, in accordance with the provisions of this section. When the proposal stipulates that payment will be made for the removal of specific items on a "meter", "square meter", "cubic meter", "kilogram" ("linear foot," "square foot," "square yard," "cubic yard," "pound,") or "each" basis, measurement will be made by the unit stipulated in the contract.

202.11 Basis of Payment. The accepted quantities of structures and obstructions removed and stored or disposed of, as directed, will be paid for at the contract lump sum price bid or at the price bid per unit specified in the proposal, which prices shall be full compensation for removal and storage or disposal of such items, including excavation and backfill incidental to their removal, and the custody, preservation, storage on the right-of-way, and disposal as

provided herein. Payment for raised pavement markers removed for storage will include the cost of the asphalt concrete to fill depressions caused by removal of the castings.

Payments will be made at the contract prices bid under:

Item	Unit	Description
202	Lump sum	Structures removed
202	Lump sum, cubic meter or kilogram(cubic yard or pound)	Portions of structures removed
202	Meter (linear foot)	Pipe removed for re-use or storage
202	Meter (linear foot)	Pipe removed
202	Square meter (square yard)	Pavement removed
202	Square meter (square yard)	Wearing course removed
202	Square meter (square yard)	Base removed
202	Square meter (square foot)	Walk removed
202	Lump sum	Steps removed
202	Meter (linear foot)	Curb removed
202	Meter (linear foot)	Curb and gutter removed
202	Meter or square meter (linear foot or square yard)	Gutter removed
202	Meter (linear foot)	Curb removed for storage
202	Each	Precast traffic dividers removed for re-use or storage
202	Lump sum	Buildings demolished
202	Each	Underground storage tank removed
202	Each	Regulated underground storage tank removed
202	Each	Septic tank removed
202	Each	Privy vault removed
202	Meter (linear foot)	Guardrail removed
202	Meter (linear foot)	Guardrail removed for re-use for storage
202	Meter (linear foot)	Fence removed for re-use or storage
202	Each	Raised pavement markers removed for storage
202	Each	Manhole removed
202	Each	Manhole abandoned
202	Each	Catch basin or inlet removed
202	Each	Catch basin or inlet abandoned

ITEM 207 TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

207.01 Description

207.02 General

207.03 Construction Requirements

207.04 Performance

207.05 Method of Measurement

207.06 Basis of Payment

207.01 Description. This work shall consist of temporary control measures as detailed in the plans or ordered by the Engineer during the life of the contract to control soil erosion and sedimentation through use of straw or hay bales, dikes, slope protection, sediment pits, basins and dams, slope drains, coarse aggregate, mulches, grasses, filter fabrics, ditch lining and other erosion control devices or methods.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary control may be required for construction work outside the right-of-way such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sites.

207.02 General. Commercial fertilizer shall be (12-12-12) and shall conform to 659.03.

Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching material shall be applied in accordance with 659.

Temporary ditch checks shall consist of straw or hay bales or coarse aggregate.

Temporary inlet filters and filter dikes shall consist of straw or hay bales or filter fabric fence. Filter fabric for sediment fences shall meet the requirements of 712.09, Type C.

Temporary dikes shall consist of suitable 203 material.

Temporary slope drains shall consist of pipe, coarse aggregate, riprap, rock channel protection, mats, plastic sheets, or other materials. Such materials shall be approved by the Engineer before being incorporated into the work.

Sediment pits may be included as part of slope drain construction.

Temporary sediment basins and dams shall be constructed by methods described in Item 203 Excavation and Embankment or Item 601 Rock Channel Protection, Type C without filter. Sand or filter fabric may be required.

Temporary ditch lining shall meet the requirements of 667, 668 or 670.

Temporary rock check dams shall be constructed of 601.08, Type C rock channel protection.

207.03 Construction Requirements. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing, the surface area of erodible earth material exposed by excavation, borrow, and fill operations and provide immediate permanent or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment. Such work will involve the construction of temporary ditch checks, filters, benches, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods necessary to control erosion and sedimentation.

The Contractor shall incorporate all permanent erosion control features into the project at the earliest possible time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. This will require the establishing of final grades and application of Items 659 Liming, if specified on the plans, Commercial Fertilizer, and Seeding and Mulching. When directed by the Engineer, the temporary items of fertilizer, seeding and mulching materials shall be used. Temporary erosion and sediment control items, the location and size of which are detailed in the plans, shall be installed by the Contractor upon commencement of any clearing or earthwork operations. Temporary control measures will be used when and as directed by the Engineer to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages.

The Engineer will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such

permanent control measures current in accordance with the accepted schedule. Mulching, seeding, and other such permanent control measures shall be applied after completion of 3.7 m (12 feet) vertical of embankment or cut, unless otherwise directed by the Engineer. Should seasonal limitations, or embankment make such coordination unrealistic, temporary erosion control measures including seeding shall be taken immediately.

The amount of surface area of erodible earth material exposed at one time by clearing and grubbing, excavation, borrow or fill shall not exceed 70 000 m² (750,000 square feet) without prior approval by the Engineer.

The Engineer may increase or decrease the allowable amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions. Factors such as the amount of exposed erodible soil adjacent to the project limits, waste and borrow sites, farm land, soil erodibility, slope, cut or fill height, exposed area contributing to a watercourse and weather will be considered in this determination.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

Temporary seeding areas shall be fertilized at 1/2 the normal plan or specification rate of application in accordance with Item 659.

All areas of temporary seeding shall be seeded with annual ryegrass sown at the rate of one kg per 100 m² (2 pounds per 1000 square feet) and mulched in accordance with Item 659.

When, in the judgment of the Engineer, project conditions are such that the incorporation of fertilizer into the soil and preparation of the seed bed cannot be performed in accordance with Item 659, these requirements may be waived except that temporary seed shall not be placed on frozen ground.

When directed by the Engineer, the seed bed shall be thoroughly watered in accordance with the requirements of Item 659. The quantity of water will be measured and paid for as Item 659 water.

When directed by the Engineer, temporary seeded areas shall be mowed and paid for in accordance with Item 659.

Temporary erosion control features shall be acceptably maintained and shall subsequently be removed or replaced when directed by the Engineer. Temporary and permanent erosion control features shall be checked after each measurable rainfall and re-established as necessary. All temporary erosion control items shall be removed before the project is accepted, unless otherwise directed by the Engineer. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with 203.05.

207.04 Performance. If proper control of soil erosion and sedimentation is not being provided by the Contractor, the Engineer may withhold progress estimates until proper control is achieved.

207.05 Method of Measurement. Temporary erosion and sediment control work, completed and accepted, will be measured as follows:

- (a) All fertilizing will be measured and paid for as Item 659 Commercial Fertilizer.
- (b) Temporary seeding and mulching will be measured by the square meter (square yard) of seeded and mulched area completed in accordance with these specifications.
- (c) Temporary slope drains and filter fabric fence will be measured by the meter (linear foot) complete in place.
- (d) Straw and hay bales installed will be counted and paid for by each bale staked in place.
- (e) Rock required will be paid for under Item 601 Rock Channel Protection, Type C without filter.
- (f) Temporary benches, dams, and sediment basins will be measured by the cubic meter (cubic yard) of excavation performed, including necessary cleaning of sediment basins, and the cubic meter (cubic yard) of embankment placed at the direction of the Engineer, in excess of plan lines and elevations.
- (g) Temporary dikes will be measured by the meter (linear foot), complete in place.
- (h) Temporary ditch protection will be measured by the square meter (square yard), complete in place.

Control work performed for protection of construction areas outside the right-of-way, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such temporary work shall be performed by the Contractor at his expense.

207.06 Basis of Payment. Accepted quantities of temporary soil erosion, and sedimentation control work ordered by the Engineer and measured as provided above, will be paid for under:

Item	Unit	Description
207	Square meter (square yard)	Temporary seeding and mulching
207	Meter (linear foot)	Temporary slope drains
207	Cubic meter (cubic yard)	Temporary benches, dams, and sediment basins
207	Each	Straw or hay bales
207	Meter (linear foot)	Filter fabric fence
207	Meter (linear foot)	Temporary dikes
207	Square meter (square yard)	Temporary ditch protection

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the proper contract price, as provided in 104.02. Should the work not be comparable to the project work under the applicable contract items, the Contractor will be ordered to perform the work on a force account basis, or by agreed unit prices, as provided in 104.03.

ITEM 256 BONDED PATCHING OF RIGID PAVEMENTS

256.01 Description

256.02 Materials

256.03 Equipment

256.04 Removal of Unsound Concrete

256.05 Preparation of Patch Area

256.06 Bonding Grout Installation

256.07 Placing Patching Material

256.08 Curing

256.09 Method of Measurement

256.10 Basis of Payment

256.01 Description. This work shall consist of furnishing the necessary labor, materials and equipment for partial depth repair of portland cement concrete pavements at spall areas adjacent to cracks/joints, including the removal of all loose and unsound concrete, bituminous patches, surface preparation, bonding coat, reconstructing the joint or crack, and the mixing, placing, finishing and curing of the mortar or concrete patches.

256.02 Materials.

Aggregate	703.02
Portland Cement	701.05
Quick Setting Concrete Mortar	705.21
Air Entraining Admixture	705.10
Curing Material-Type A or B patches	705.07
Curing Material-Type C patches	705.07

256.03 Equipment. Existing surface material may be removed by a milling machine, diamond saw and jack hammers, or similar equipment. Hand equipment may be necessary to achieve a vertical edge. Compressed air for cleaning or abrasive blasting the prepared area shall be oil and moisture free. An on-site concrete mixer will be required.

256.04 Removal of Unsound Concrete. The Engineer shall outline the areas to be removed. Spalled areas along joints less than 150 mm (6 inches) in length and 40 mm (1 ½ inches) wide at the widest point need not be repaired but may be filled with a joint sealant material as specified. The perimeter of all removal areas shall be sawed or milled to a depth of 25 mm (1 inch) to produce a vertical or slightly undercut face. Additional saw cuts may be required to facilitate removal. All unsound concrete including all patches other than sound portland cement concrete, and all obviously loose and disintegrated concrete shall be removed. The unsound concrete may be removed by chipping or hand dressing. Chipping hammers shall not be heavier than the nominal 16 kg (35-pound) class and shall be operated at an angle of less than 45 degree measured from the surface of the pavement. Any pavement reinforcing exposed in the patch areas during removal of the unsound concrete shall be removed with a cutting tool or torch.

256.05 Preparation of Patch Area. Cleaning shall closely precede application of the bonding grout and/or the patching material. The exposed faces of the concrete shall be sandblasted free of loose particles, oil, dust, traces of asphaltic concrete and other contaminants before patching. All sandblasting residue must be removed just prior to placement of the concrete bonding agent. Air hoses may be used for this purpose. No operations without reasonably available engineering controls that limit fugitive dust will be acceptable. The Contractor shall be aware that there are state, regional, and local government agencies throughout the State that have requirements regarding control of dust generated by the blasting operation. For Type A and Type B patches, and Type C patches which do not use water as the activator, the prepared surface shall be left in the condition as recommended by the manufacturer. Any additional

surface preparation shall be in accordance with the manufacturers recommendations for the patching material used.

Joints in or along the patch shall be re-created with a joint board of the proper dimensions. The board shall extend below the prepared surface and shall be of a width equal to the existing joint. After one hour, the joint board shall be removed in a manner that does not damage the patch.

256.06 Bonding Grout Installation. The grout for bonding Type A patches shall consist of equal parts by volume of portland cement and sand, mixed with sufficient water to form a stiff slurry. The consistency of this slurry shall be such that it can be applied with a stiff brush or broom to the existing surface in a thin, uniform coating. The coating of grout, shall be scrubbed onto the dry surface immediately before placing the concrete. Care shall be exercised to ensure that no excess grout is permitted to collect in low spots. In no case shall the grout be permitted to dry before placing the new concrete. Grout shall be painted over all sawed joints between the new and existing concrete immediately after the finishing has been completed. Type B and C patches shall be bonded according to the manufacturer's recommendations.

256.07 Placement of Patch Material. The mortar or concrete shall be placed as Type A, B or C.

Type A. The mixture shall consist of 1 part high-early- strength Portland cement, 1 ½ parts fine aggregate and 1 ½ parts No. 8 coarse aggregate by volume. Sufficient air-entraining agent shall be added to maintain an air content of 8±2 percent. The slump shall be the minimum practical for placing and in no case shall it exceed 100 mm (4 inches). The materials shall be mixed at the site. Ready-mixed concrete shall not be permitted. The mix shall be placed in the area to be patched while the bonding grout is still wet, slightly overfilled, vibrated, and struck off.

Type B. Patching material shall be made using Quick Setting Concrete Mortar 705.21, Type 1 or 2. The mortar shall be mixed and placed as per manufacturer's recommendations. Coarse aggregate may be added in accordance with the manufacturer's instructions when the depth of the patch exceeds 25 mm (1 inch).

Type C. Patching material shall be made using a blend of Quick Setting Concrete Mortar 705.21, Type 2 material and selected aggregates with an activator. These materials shall be mixed and placed as per manufacturer's recommendations. Coarse aggregate may be added in accordance with the manufacturer's instructions when the depth of the patch exceeds 25 mm (1 inch).

Patches that are less than 3.7 m (12 feet) in length shall be screeded longitudinally. For patches over 3.7 m (12 feet) in length, the screed shall be placed perpendicular to the centerline.

The Contractor shall test the surface of the plastic concrete for trueness and for being flush with the edges of the adjacent slabs by use of a 3.0 m (10 foot) straightedge. For patches 3.0 m (10 foot) or less in length, the straightedging shall be done by placing the straightedge parallel to the pavement centerline with the ends resting on the existing pavement and drawing the straightedge across the patch. The straightedge should be in contact with the existing pavement while drawing it across the patch. Any high or low areas exceeding 3 mm in 3.0 m (1/8 inch in 10 feet) shall be corrected. If any corrections are made, the surface shall be rechecked.

The surface of the concrete shall be textured similar to the surrounding pavement.

256.08 Curing. Type A patches shall be cured in accordance with 451.10 except the modulus of rupture shall be 2.8 MPa (400 psi) before opening to traffic. Type B and C patches shall be cured in accordance with manufacturer's recommendations

256.09 Method of Measurement. The quantity shall be the actual area in square meter (square feet) of the exposed surface of all patches, irrespective of the depth of the patch, complete, in place and accepted. The area of each patch less than 0.2 m² (2 square feet) will be increased to 0.2 m² (2 square feet) for payment purposes.

ITEM 304 AGGREGATE BASE

304.01 Description

304.02 Aggregate

304.03 Prior to Spreading

304.04 Spreading

304.05 Compaction

304.06 Finished Surface

304.07 Method of Measurement

304.08 Basis of Payment

304.01 Description. This work shall consist of furnishing, placing and compacting one or more courses of aggregate, including furnishing and incorporating all water required for compacting, on a prepared surface in accordance with these specifications, and in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the Engineer.

304.02 Aggregate. The aggregate shall be crushed carbonate stone, crushed gravel, crushed air-cooled blast furnace slag, granulated slag, or open hearth slag from approved sources on file at the Laboratory. Crushed carbonate stone, crushed gravel, crushed air-cooled blast furnace slag, and open hearth slag from approved sources on file at the Laboratory shall meet the following gradation requirements and the requirements of 703.04. In addition, open-hearth slag shall conform to the stockpiling and aging requirements of 703.01.

Sieve	Total Percent Passing
50 mm (2 inch)	100
25.0 mm (1 inch)	70-100
19.0 mm (3/4 inch)	50-90
4.75 mm (No. 4)	30-60
600 µm (No. 30)	9-33
75 µm (No. 200)	0-13

Granulated slag shall also meet the requirements of 703.08.

Aggregate acceptance shall be determined prior to incorporation into the work based on samples taken from stock piles.

304.03 Prior to Spreading. The Engineer will sample the Contractor's stockpile. A moisture-density curve will be made in accordance with the AASHTO T 99 for the purpose of establishing the initial optimum moisture.

The aggregate material shall have reasonably uniform gradation and moisture, and at a moisture content not less than minus four percent of optimum moisture prior to the spreading operation. The material shall be handled in a manner to minimize segregation. The stockpile shall be thoroughly mixed or regraded if the aggregate material is segregated.

304.04 Spreading. The aggregate material shall be spread upon the prepared surface. The compacted thickness of a single layer shall not exceed 150 mm (6 inches) when vibratory equipment is used in conjunction with other methods of compaction. The aggregate material shall be constructed in two or more approximately equal layers when the specified compacted thickness exceeds 150 mm (6 inches). The maximum compacted thickness of one layer shall not exceed 75 mm (3 inches) when vibratory compaction equipment is not used. A maximum compacted thickness of 200 mm (8 inches) is allowed when a variable depth is specified under the pavement or in the shoulder adjacent to the pavement.

The material shall be placed with self-propelled spreading machines capable of placing the aggregate true to line and grade.

Approved hand placing methods may be used when the total area of the aggregate material is 1700 square meters (2,000 square yards) or less, or in small areas where machine spreading is impractical. In these areas, the compaction requirements shall be in accordance with 203.09(b).

Water shall be added to the aggregate material or the aggregate material shall be dried to bring it to within minus four percent of the optimum to plus two percent of the optimum moisture prior to the compaction operation. This moisture range shall be maintained during all compaction operations. If water is required, it shall be applied in a manner that will not soften the lower courses.

304.05 Compaction. The compaction of the aggregate material shall immediately follow the spreading operation. The minimum roller weight shall be nine metric tons (10 tons). The weight of the rollers for the test section and production rolling shall be the same. Light rollers may be used in small areas or when heavier rollers are not

practical. Approved compaction equipment may consist of vibratory or static rollers and vibratory equipment and rollers.

The material shall have sufficient stability to support the weight of the rollers without excessive rutting or deflection. When the material falling within a grading permitted by the specifications is used and surface stability cannot be obtained, a sufficient quantity of crushed angular material shall be added to secure the stated stability. Vibratory equipment alone may be permitted only in small areas or areas where rollers are impractical. In areas where normal production rollers cannot be used, the compaction requirements shall be in accordance with 203.09(b). At the beginning of the compaction operation, the density requirement shall be determined by compacting a short test section. The compaction of the test section shall continue until no further increase in density can be achieved or when the difference in density between two consecutive coverages is less than 32 kilograms per cubic meter (2 pounds per cubic foot). The remainder of the material shall be compacted to a density of not less than 98 percent of the test section density.

The production density may be checked before or after the finishing operation.

A new test section density may be required if the aggregate material characteristics or the supporting materials change appreciably. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregate material is firmly keyed.

Water shall be uniformly applied over the aggregate materials during the compaction operation in the amount necessary to maintain the specified moisture content.

During the test section or the production rolling, if the aggregate material is unstable due to excess moisture, the moisture shall be decreased to secure stability.

The finished surface of this course shall have sufficient stability to support loaded construction equipment used in the construction of this and subsequent courses without rutting or deflection in excess of the surface tolerances permitted herein.

304.06 Finished Surface. The finished surface shall not vary more than 10 mm (3/8 inch) from a 3.0 m (10 foot) straightedge parallel to the centerline nor more than 13 mm (1/2 inch) from a template conforming to the required cross section. The Contractor shall furnish straightedges, templates or other devices satisfactory to the Engineer and check the surface for conformance with these requirements.

Any irregularities or depressions that develop in the finished surface of the aggregate material shall be corrected by loosening the surface and adding or removing material until the surface presents a smooth regular appearance.

304.07 Method of Measurement. Aggregate base course will be measured by the number of cubic meters (cubic yards) computed from plan lines, compacted in place.

Where variable depth is specified, the number of cubic meters (cubic yards) of aggregate will be measured by conversion from weight on the following basis:

	kg/m ³	lbs/yd ³
Crushed stone	2375	4000
Crushed gravel	2375	4000
Crushed slag, 1450 kg/m ³ (90 lbs. per cu. ft.)*	2140	3600
Crushed slag, 1450 to 1600 kg/m ³ (90 to 100 lbs. per cu. ft.)*	2375	4000
Crushed slag more than 1600 kg/m ³ (100 per cu. ft.)*	2670	4500
Granulated slag	1660	2800

*Based on average dry rodded weight of standard sizes of slag aggregates on record at the Laboratory.

The kilograms per cubic meter (pounds per cubic yard) for aggregate mixtures shall be determined by the test section density required under 304.05 Compaction.

304.08 Basis of Payment. Payment for accepted quantities, complete in place, will be made at contract prices for:

Item	Unit	Description
304	Cubic meter (cubic yard)	Aggregate base

**400 FLEXIBLE PAVEMENT
401 PLANT MIX PAVEMENTS GENERAL**

401.01 Description

401.02 Composition

401.021 Contractor Mix Design and Quality Control

401.022 Asphalt Content Nuclear Gauge

401.03 Materials

401.031 Use of Reclaimed Pavement

401.04 Mixing Plants

401.041 Field Laboratory

401.05 Weather Limitations

401.051 Notification

401.06 Bituminous Material Preparation

401.07 Aggregate Preparation

401.08 Mixing

401.09 Hauling

401.10 Spreading Equipment

401.11 Rollers

401.12 Conditioning Existing Surface

401.13 Spreading and Finishing

401.14 Compaction

401.15 Joints

401.16 Spreading and Surface Tolerances

401.17 Method of Measurement

401.18 Basis of Payment

401.01 Description. These specifications include general requirements applicable to all types of plant mix bituminous pavements irrespective of gradation of aggregate, kind and amount of bituminous material, or pavement use. Deviations from these general requirements will be covered in the specific requirements for each type. This work shall consist of one or more courses of bituminous mixture constructed on the prepared foundation in accordance with these specifications and the specific requirements of the type under contract, and in reasonably close conformity with the lines, grades and typical cross sections shown on the plans or established by the Engineer. Bituminous plant mix pavement thickness shown on the plans or stated in the proposal is for exclusive use in calculating the weight required to be placed per unit of surface area.

401.02 Composition. The bituminous plant mix shall be composed of a mixture of uniformly graded aggregate and specified type and grade of bituminous material.

The composition table for the type under contract specifies the limits within which the Job Mix Formula (JMF) will be set by the Laboratory after examination of the materials the Contractor proposes to use. Should the Contractor propose to change the source of the materials, sufficient notice shall be given the Laboratory that samples may be taken and the JMF checked prior to making the change.

The Laboratory will establish a JMF which will produce a satisfactory mix and may make changes as required; no change, however, shall be made unless authorized by the Laboratory.

During production, variation from the JMF, as shown by the plant inspector's analysis, of plus or minus 4 percent passing the 4.75 mm (No. 4) sieve or plus or minus 0.3 percent bitumen shall be investigated and corrected by the Contractor.

Acceptance for gradation and bitumen content will be based upon the mean of the results of all tests performed by the plant inspector during a day's production.

Production will be considered acceptable if the following tolerances are not exceeded and the remaining sieves do not exceed the limits of the applicable specification:

Deviation of the Mean		
Mix Characteristics	from the Design	Range
Bitumen content	± 0.5 percent	1.0
4.75 mm (No. 4) sieve	± 6 percent	12

The disposition of production exceeding these limits shall be as provided in the second paragraph of 105.03.

A variation from the JMF exceeding these tolerances shall be sufficient cause for the Laboratory to order production discontinued until the cause of the variation is corrected.

401.021 Contractor Mix Design and Quality Control. When the Contractor is required to perform the mix design or quality control, the laboratory where the mix design or quality control tests are to be performed and the personnel performing the tests shall meet the requirements of Supplement 1041.

401.022 Asphalt Content Nuclear Gauge. Asphalt Content Nuclear Gauges shall be calibrated in accordance with Supplement 1043 by an employee of the Contractor with a Level 1 rating in accordance with Supplement 1041. The calibration verification sample shall be mixed and tested with a Department employee present.

The Contractor shall provide and dispose of the solvent used for cleaning the Asphalt Content Nuclear Gauge pans.

401.03 Materials.

Materials shall be :	
Aggregates	<u>703.05</u>
Bituminous material (<u>301</u> , <u>402</u> , <u>403</u> , <u>404</u> , <u>412</u> , <u>446</u> , <u>448</u>)	<u>702.01</u>
Bituminous material (<u>401.12</u>)	<u>702.01</u> , <u>702.02</u> , <u>702.03</u> , <u>705.04</u>
Aggregate and bituminous material shall be sampled in accordance with <u>106.01</u>	

401.031 Use of Reclaimed Pavement. The Contractor may use a blend of new materials in combination with reclaimed asphalt concrete pavement or reclaimed bituminous aggregate base pavement obtained from either a Department or Ohio Turnpike Commission project. A maximum of 10 percent of reclaimed pavement may be used without adjusting the Job Mix Formula (JMF). This percentage is based on the dry weight of all the materials used. The combined mixture shall fall within the limits of the item specified.

The Contractor shall identify the reclaimed pavement as to type, source, gradation and bitumen content. The stockpile shall be free of contamination and uniform in composition. Prior to stockpiling, the proposed sites for storing the reclaimed pavement shall be cleaned, graded and compacted to produce a firm level base. Stockpiles shall be subject to approval by the District Engineer of Tests prior to use. Additional reclaimed pavement shall not be added to an approved stockpile, except when the reclaimed pavement proposed for use is being reclaimed concurrently with the production of the recycled mixture.

The reclaimed pavement shall be of proper size to allow for complete breakdown of material in the plant. During production, a 50 mm (2-inch) screen shall be placed on the cold feed. Incomplete mixing shall be reason to require a smaller screen to be placed on the cold feed. Due to variations in the reclaimed pavement gradation, a maximum of 5 percent oversize material will be tolerated in the completed mix, provided it can be incorporated into the work with satisfactory results.

When reclaimed pavement is used in a surface course, the reclaimed pavement to be used shall be processed to a maximum size of 19 mm (3/4-inch) before incorporating the reclaimed pavement into the mix. If more than 10 percent reclaimed pavement is going to be incorporated into either a 446 or 448 surface course, the processed reclaimed pavement shall be included in the mix design process to establish the Job Mix Formula (JMF).

401.04 Mixing Plants. Plants shall be approved by the Director prior to preparation of the mixtures. General requirements for bituminous concrete mixing plants are contained in Section 750.01 and 750.03.

The bitumen controls for the computerized plant shall be set at the virgin bitumen content of the JMF at all times unless change is authorized by the Laboratory.

401.041 Field Laboratory. The Contractor shall provide an approved building or room for the plant inspector to use in the performance of the required tests. This building or room shall have equipment meeting the requirements of a Level 0 Laboratory as specified in Supplement 1041. A layout sketch for a suitable field laboratory may be obtained from the Office of the Director of Transportation. The building shall be floored and provide a minimum floor area of 12 m² (130 square feet) of suitable working space. It shall have windows on at least three sides to provide suitable light and cross ventilation and an outside door. Windows in one wall shall provide a direct view of the mixing platform. The windows and door shall be provided with locks.

The building shall have satisfactory lighting and grounded electrical switches and outlets. An exhaust fan shall be provided and located so as to adequately ventilate areas where solvent is stored and used. The ventilation shall be such that there is no odor or solvent in the breathing zone of the plant inspector.

Heating and cooling equipment shall be provided that will maintain a temperature range of 21 to 27 C (70 to 80 F) during working hours when the exhaust fan is in operation. Open flame heaters shall not be used.

The building shall have suitable work benches for weighing, sieving and Asphalt Content Nuclear Gauge operations. Work benches shall have drawers. A desk or suitable table for office work shall be provided.

The site shall have conveniently accessible telephone facilities over which conversations can be plainly heard. The above laboratory may be the Contractor's Level 1 Laboratory and may be shared with Contractor personnel. If there is a conflict between the personnel sharing the Contractor's laboratory, the Laboratory may order the Contractor to provide the plant inspector with a separate laboratory meeting the above requirements.

401.05 Weather Limitations. Bituminous plant mixtures shall only be placed when the surface is dry and when weather conditions are such that proper handling, finishing and compaction can be accomplished. In no case, however, shall bituminous plant mixtures be placed when the surface temperature is below the minimum established in the following table:

Course Thickness	Minimum Surface Temperature	
75 mm (3.0 inches) and over	2 C	36 F*
38 to 74 mm (1.5 to 2.9 inches)	5 C	40 F
25 to 37 mm (1.0 to 1.4 inches)	10 C	50 F
Less than 25 mm (1.0 inch)	16 C	60 F
Variable Intermediate, 0 to 75 mm (0 to 3.0 inches)	5 C	40 F
*In lieu of 2 C (36 F), a minimum air temperature of 5 C (40 F) shall be used when paving on an aggregate base, subbase or subgrade. In addition to the above surface temperature requirements, no surface courses shall be placed when the air temperature is less than 5 C (40 F)		

401.051 Notification. The Contractor shall notify the Engineer a minimum of 24 hours prior to start of paving on a project. If the Contractor does not pave for one week, the Engineer shall be notified a minimum of 24 hours prior to resuming paving on a project.

401.06 Bituminous Material Preparation. The bituminous material shall be heated and delivered to the mixer within the temperature range specified in 702.00. Bituminous material shall not be used while foaming.

401.07 Aggregate Preparation. Aggregates shall be fed to the cold elevator in their proper proportions and at a rate to permit correct and uniform control of heating and drying. All aggregates in the hot bins that will produce a mix outside the temperature limits or that contain sufficient moisture or expanding gases to cause foaming in the mixture shall be removed and returned to the proper stockpiles.

401.08 Mixing. When batch mixing is used, the order or sequence in which the several aggregates are drawn or weighed shall be determined by the Laboratory. After all of the aggregate is in the mixer, the bituminous material shall be added in an evenly spread sheet over the full length of the mixer. The mixing time shall be the interval between the start of application of the bituminous material and the opening of the mixer gate. All bituminous material required for one batch shall be discharged in not more than 30 seconds. The Laboratory will establish a minimum mixing time of not less than 30 seconds.

When continuous mixing is used, the bituminous material shall be added in an evenly spread sheet over the full width of the mixer at the charging end. The Laboratory shall establish mixing time of not less than 30 seconds. The mixing time is a ratio of kg (pounds) of deadload of the mixer to the kg/s (pounds per second) delivered. The deadload shall be determined by weighing a mixer full of material. The kg/s (pounds per second) delivered shall be determined by timing and weighing a load of mixed material.

Temperatures of the several mixtures at the plant shall be maintained within the ranges set by the Laboratory for the mix design. The temperature of the mixture on arrival at the project site shall be as determined by the Engineer in keeping with the temperature range set for the mix design and heat losses in transit.

401.09 Hauling. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds from which the entire quantity of mixture is discharged smoothly into the spreading equipment.

Prior to loading, a thin coating of material shall be applied to the inside surfaces of the truck bed to prevent adhesion of mixture to the bed surfaces. The use of fuel oils for this purpose is prohibited. Only material which will not contaminate and alter the characteristics of the mixture will be permitted. Truck beds shall be drained prior to loading.

Each truck shall have a securely fastened, waterproof cover of suitable material to adequately protect the mixture from the weather. At the request of the Engineer, covers shall be removed prior to dumping into the paver.

When hot mixtures are being transported at prevailing air temperatures below 10 C (50 F) or when the length of haul exceeds 32 km (20 miles), all truck beds shall be insulated to maintain workable temperature of the mixture, and all covers shall be so fastened as to exclude all wind. The maximum distance mixtures may be transported from mixing plant to paving site shall not exceed 80 km (50 miles) except by specific permission of the Director.

401.10 Spreading Equipment. Spreading equipment shall be self-contained and of sufficient size, power and stability to receive, distribute and strike-off the bituminous mixture at rates and widths commensurate with the typical sections and other details shown on the plans. The spreading equipment shall have automatic control systems which maintain the screed in a constant position relative to profile and cross-slope references. These references shall be such that control of the screed position is reasonably independent of irregularities in the underlying surface and of the spreader operation. Approval of spreading equipment by the Engineer will be based on the demonstrated capability of the equipment to place the mixture to the required cross-section, profile and alignment in an acceptable, finished condition ready for compaction.

Specialized equipment or hand methods approved by the Engineer may be employed to spread the bituminous mixture where the use of standard full scale spreading equipment is impractical due to the size or irregularity of the area to be paved.

401.11 Rollers. Rollers shall be of the steel wheel and pneumatic tire types meeting the minimum requirements of the following tables. All ballasting shall conform to manufacturer's specifications.

The maximum capacities of the rollers, in square meters (square yards) per hour, shall be: 600 (700) for three-wheel and tandem; 13 per 25 mm (15 per inch) width for trench; Vibratory 13 per 25 mm (15 per inch) width for vibrating roll, 3 per 25 mm (3 per inch) width with static roll (no vibrations); 850 (1000) for Type I pneumatic tire; and 600 (700) for Type II pneumatic tire.

STEEL WHEEL ROLLERS				
Roller Type	Three Wheel	Tandem	Vibratory Static Trench	
Total weight, metric tons (tons)	9 (10)	7-11 (8-12)	7-11(8-12)	
Compression rolls, kN/m (pounds per inch width), min.	53 (300)	35 (200)	21(120)	53 (300)

PNEUMATIC TIRE ROLLERS	
Type I	
Tire size, minimum	229 X 508 mm (9.00 X 20)
Wheel load, minimum	2250 kg (5000 pounds)
Average tire contact pressure, minimum	590 kPa (85 psi)
Type II	
Tire size, minimum	191 X 381 mm (7.50 X 15)
Wheel load, minimum	900 kg (2000 pounds)
Average tire contact pressure, minimum	380 kPa (55 psi)

Pneumatic tire rollers shall be self-propelled, reversible units with vertical oscillation on all wheels on at least one axle. Tire inflation pressure shall be determined by the Contractor to meet the specified minimum contact area and contact pressure requirements. The Contractor shall furnish tire manufacturer's charts or tabulations for verification of the required inflation pressure by the Engineer. Tire inflation pressure shall be checked by the Contractor as directed by the Engineer and shall be maintained within 35 kPa (5 psi) of the required pressure.

Rolls and wheels shall be provided with the necessary accessories to prevent adhesion of the mixture and shall be kept properly moistened with water or water containing a detergent or other approved additive. The use of excess liquid will not be permitted.

401.12 Conditioning Existing Surface. The surface on which the bituminous plant mix is to be placed shall be cleaned and maintained free of accumulations of materials that would, in the judgment of the Engineer, contaminate the mixture, prevent bonding or interfere with spreading operations. Where approved subgrade or pavement courses previously constructed under the contract become loosened, rutted or otherwise defective, the deficiency shall be corrected in accordance with the requirements of the item or items involved prior to the spreading of bituminous plant mix for a subsequent pavement course.

When a quantity of bituminous plant mix is specified for use in spot leveling or patching an existing pavement surface, the material needed to effect the corrections shall be spread and compacted as directed by the Engineer. Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin, uniform coating of bituminous material prior to the bituminous mixture being placed against them.

Where mixture is to be placed against the vertical face of an existing pavement structure, the vertical face shall be cleaned of foreign material and given an application of bituminous material in a manner which results in a coating of approximately one L/m² (0.25 gallon per square yard).

Prior to placing a surface course onto an intermediate course, the Contractor shall apply a tack coat to the intermediate course in accordance with 407.052.

401.13 Spreading and Finishing. The mixture shall be spread at a rate determined by calculation using the specified thickness and the compacted width of the pavement course being placed, and the weight to volume conversion factors given in 401.17. The actual rate of spreading the mixture shall be maintained equal to the required calculated rate within the tolerance specified in 401.16 except for pavement courses specified for the purpose of leveling an existing pavement surface in which the actual rate of spreading the mixture may vary from the required calculated rate as approved by the Engineer to accomplish the intended purpose.

Approved equipment or methods in use shall result in the mixture being spread and finished in such condition that compaction can follow immediately. The mixture shall be contained laterally during the spreading operation by means of sufficient side plates. When paving in excess of the nominal paver width, only a permanent extension or an adjustable extension with full auger extensions shall be used when matching a previously placed pavement course. Such extensions shall have the ability to heat. Strike-off plates may be used on adjacent berm areas. Supplemental hand forming and tamping shall be performed where irregularities develop and where the mixture is placed by hand methods. The mixture as spread and finished shall be uniform in composition and surface texture. Conditions causing objectionable segregation of the mixture components or irregularities in surface texture shall be corrected and any portion of the pavement course found to be defective in surface texture or composition before or after compaction shall be removed and replaced or otherwise corrected in a manner satisfactory to the Engineer.

The spreading operation shall be coordinated with the rate of production and delivery of the mixture to attain uniform, continuous progress. Erratic spreader operation due to irregular contact with the hauling vehicle, surging in the feed and distribution of the mixture, or other cause shall be avoided. Sufficient control of the spreading equipment with regard to line and grade references shall be maintained that the pavement course, when compacted as specified, will be in reasonable conformance with the lines, grades and typical sections shown on the plans or established by the Engineer.

The spreading operations on bridge deck waterproofing membranes shall not displace or damage the membrane.

401.14 Compaction. Immediately after the bituminous mixture has been spread and any surface irregularities adjusted, the mixture shall be compacted uniformly using rollers meeting the requirements of 401.11. The rate at which the mixture is spread shall not exceed the total of the specified capacities of the rollers in use, except that the rate of spreading shall not exceed twice the total capacity of the rollers in use for the compaction of mixture spread as an intermediate or pre-leveling course less than 25 mm (one inch) thickness.

The Contractor shall coordinate the spreading of the mixture with the application of the required roller coverage, giving consideration to the rate of cooling of the mixture as affected by lift thickness and environmental conditions. The required roller coverage shall be completed during the period of time in which the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

Base mixtures shall be compacted using a combination of both steel and Type I pneumatic tire rollers except in small areas where these mixtures may be compacted as approved by the Engineer using any one of the specified rollers.

Intermediate and surface mixtures shall be compacted using a three-wheel roller in the breakdown position (roller immediately behind the paver) of the roller train, except in small areas where these mixtures may be compacted as approved by the Engineer using any one of the specified roller types.

Variable depth courses shall be compacted using a combination of both steel and pneumatic tire rollers, except in small areas where these mixtures may be compacted as approved by the Engineer using any one of the specified rollers.

Vibratory rollers shall not be used on courses with a thickness under 38 mm (1 1/2 inches).

When vibratory rollers are used, they shall be supplemented by three-wheel or pneumatic tire rollers.

Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the centerline at a slow, uniform speed. After each coverage or complete round trip, the roller shall progress toward the crown of the road by overlapping the previous pass by at least one half the width of the compression roll. On superelevated curves, the rolling shall begin at the low side and progress toward the high side. In all cases where a longitudinal joint is being made, it shall be rolled first and then followed by the applicable rolling procedure.

Rolling shall be continued until full coverage of the course has been completed and all roller marks are eliminated. Care shall be taken to prevent displacement of the edge line and grade. Where displacement occurs, the area shall be corrected immediately in a manner satisfactory to the Engineer.

Along curbs, headers, walls and in other areas not accessible to rollers, the mixture shall be thoroughly compacted with hot, hand tampers or with mechanical tampers. On depressed areas, trench rollers or rollers fitted with compression strips may be used.

Mixture that becomes loose, broken, contaminated or otherwise defective shall be replaced with fresh, hot mixture compacted to conform with the surrounding area.

401.15 Joints. Placing of the bituminous paving shall be as continuous as possible. Longitudinal and transverse joints shall be made in a careful manner. Joints shall be "set up" at the proper height above the adjacent construction to receive maximum compaction. Where the edge of the new surface has been significantly rounded by the action of traffic, it shall be trimmed to a vertical face prior to placing the adjacent pavement. On projects where traffic is permitted to cross the edge of the new pavement lane, the longitudinal joint of the adjacent lane or berm shall be completed within 24 hours. A well bonded and sealed joint is required.

Hot longitudinal joints shall be formed using bituminous pavers operating in contiguous lanes, one just ahead of the other. The distance between pavers in adjacent lanes shall not exceed the distance that a normal size load of mixture will cover. The loads of mixture as they arrive shall be alternated between the pavers. Rollers performing the initial rolling operation in one lane shall in no case be allowed closer than 0.3 m (12 inches) to the longitudinal joint until the adjacent lane is placed.

In lieu of hot joint construction using multiple pavers, full width construction with a single unit paver may be used.

All cold longitudinal joints on intermediate and surface courses shall be compacted using a three-wheel roller.

All cold joints on surface courses, and any bituminous concrete course that is open to traffic for more than 30 days, shall be sealed by coating the vertical face of the cold joint with bituminous material 702.01, 702.02, or 702.04, applied at a rate of one L/m² (0.25 gallon per square yard).

The bituminous material used will be measured by the liter (gallon) and payment for accepted quantities complete in place will be made at the unit bid price for 407 tack coat. If there is no pay item provided for 407 tack coat, the cost of sealing joints as described above shall be included in the unit price bid for the asphalt concrete courses.

401.16 Spreading and Surface Tolerances. When a uniform course is specified, the Contractor shall make checks and adjustments as indicated to maintain the rate of spreading within a tolerance of plus or minus 5 percent of the required calculated weight per unit of area.

When variable depth courses are specified, the Contractor shall place the mixture at rates established by the Engineer, in accordance with the intent of the plans.

When a longitudinal profile is specified by elevations on the plans, the longitudinal profile of the completed pavement surface shall not deviate from parallel with the specified profile by more than 21 mm in 15 m (0.07 feet in 50 feet). Prior to placing the surface course, the Contractor shall check the profile of the preceding course at 15 m (50-foot) intervals along the outside edge of each traffic lane and along any additional line described in superelevation tables and shall submit a tabulation of the results to the Engineer for approval. Corrective work necessary for compliance with the profile tolerance shall be performed prior to placing the surface course. This requirement shall not apply to small incidental areas of pavement less than 150 m (500 feet) in length.

The transverse slope of the surface of the completed course shall not vary from the specified slope by more than 10 mm in 3.0 m (3/8 inch in 10 feet).

The surface of each completed course shall not vary from the testing edge of a 3.0 m (10 foot) straightedge by more than the tolerance specified for the type under contract. The Contractor shall furnish straightedges and straightedges

equipped with levels or other devices satisfactory to the engineer and shall check the surface for conformance with requirements.

401.17 Method of Measurement. The Contractor shall be responsible for recording the net weight of each truck load of mixture to the nearest 50 kg (100 pounds) in triplicate on plant ticket forms approved by the Director. Where the pay quantities are established by platform scales, the Contractor shall provide a tare weight for each truck at the beginning of each day's operation and a minimum of every four hours of operation each day. The Engineer may require additional tare weight measurements at any time and shall have the right to monitor all weighing operations and may require reweighing trucks at any time or location. Any discrepancies shall be corrected immediately. Continued non-compliance will result in the Department taking necessary and appropriate action, such as, but not limited to, assigning a Department ticket writer to the plant. All costs incurred by the Department as a result of taking such necessary and appropriate action will be assessed against the Contractor.

One copy of the plant ticket shall accompany each load delivered to the paver and shall be presented to the Engineer. The total of the weights recorded on the plant tickets representing mixture finished in accordance with contract requirements shall be converted to cubic meters (cubic yards) for payment using the conversion factors in the following table. However, when there is a mix design available on the project, the Laboratory shall establish the conversion factor to be used from the approved mix design. When uniform courses are specified, the number of cubic meters (cubic yards) to be paid for shall not exceed the quantity calculated from plan lines and dimensions.

Aggregate	Kilograms Per Cubic Meter	Pounds Per Cubic Yard
Gravel and stone	2370	4000
Slag, less than 1450 kg/m ³ (90 lbs. per cu. ft.)*	2135	3600
Slag, 1450 to 1600 kg/m ³ (90 to 100 lbs. per cu. ft.)*	2370	4000
Slag, more than 1600 kg/m ³ (100 lbs. per cu. ft.)*	2550	4300
*Based on average dry rodded weight at the Laboratory		

401.18 Basis of Payment. All work performed and measured as prescribed above will be paid for as provided in the respective items for each type.

ITEM 402 ASPHALT CONCRETE

402.01 Description

402.02 Composition

402.13 Spreading and Finishing

402.16 Surface Tolerances

402.18 Basis of Payment

402.01 Description. This work shall consist of constructing an intermediate course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

The requirements of 401 shall apply; deviations from these are as follows.

The Contractor may use 448 Asphalt Concrete Intermediate Course, Type 2 in lieu of this item if he notifies the District Engineer of Tests in writing.

402.02 Composition. Coarse aggregate (No. 57, No. 67, No. 6, No. 8 or a combination thereof) and fine aggregate shall be combined in such proportions that the resulting blend shall be as directed by the Laboratory but within the following limits.

Sieve	Total Percent Passing
37.5 mm (1 1/2 inch)	100
25.0 mm (1 inch)	95-100
12.5 mm (1/2 inch)	60-90
4.75 mm (No. 4)	35-65
1.18 mm (No. 16)	15-45
300 µm (No. 50)	3-22
75 µm (No. 200)	0-8

Bitumen content shall be as directed by the Laboratory within the following limits.

Bitumen (Percent of total mix)	4.0 to 12.0
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402.13 Spreading and Finishing. Where the mixture is placed for correcting irregularities in the existing pavement, the maximum compacted depth of any one layer shall be 75 mm (3 inches).

402.16 Surface Tolerances. The variation of the surface from the testing edge of the 3.0 m (10 foot) straightedge shall not exceed 6 mm (1/4 inch). Variations in excess of slope or surface tolerances shall be corrected by adding or removing material in a manner satisfactory to the Engineer.

402.18 Basis of Payment. Payment for accepted quantities, complete in place, will be made at the contract price for:

Item	Unit	Description
402	Cubic meter (cubic yard)	Asphalt concrete

ITEM 404 ASPHALT CONCRETE

404.01 Description

404.02 Composition

404.12 Conditioning Existing Surface

404.13 Spreading and Finishing

404.15 Joints

404.16 Surface Tolerances

404.18 Basis of Payment

404.01 Description. This work shall consist of constructing a surface course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

The requirements of 401 shall apply; deviations from these are as follows.

The Contractor may use 448 Asphalt Concrete Surface Course, Type 1 in lieu of this item if he notifies the District Engineer of Tests in writing.

404.02 Composition. Coarse aggregate (No. 8) and fine aggregate shall be combined in such proportions that the resulting blend shall be as directed by the Laboratory but within the following limits.

Sieve	Total Percent Passing
12.5 mm (1/2 inch)	100
9.5 mm (3/8 inch)	90-100
4.75 mm (No. 4)	45-75
1.18 mm (No. 16)	15-45
300 µm (No. 50)	3-22
75 µm (No. 200)	0-8

Bitumen content shall be as directed by the Laboratory within the following limits.

Bitumen (Percent of total mix)	4.5-12.0
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404.12 Conditioning Existing Surface. In areas where the surface is required to be feathered to meet an adjoining surface, the existing surface shall be coated uniformly with a thin coat of asphalt cement as specified.

404.13 Spreading and Finishing. Traffic shall not be permitted on the compacted mixture until it has cooled sufficiently to prevent glazing as determined by the Engineer.

After completion of the surface course, gutters shall be sealed with asphalt cement as directed by the Engineer. The material shall be applied at a uniform width of approximately 100 mm (4 inches) and at a rate just sufficient to fill surface voids.

404.15 Joints. Transverse construction joints shall be formed or cut to a vertical face and coated in accordance with 401.15.

404.16 Surface Tolerances. The completed surface course will be checked with straightedges and/or rolling straightedges by the Engineer. The variation of the surface course from the testing edge of the 3.0 m (10 foot) straightedge shall not exceed 6 mm (1/4 inch). Variations in excess of slope or surface tolerance shall be corrected by removal of mixture to neat lines and replacement or by surface grinding in a manner satisfactory to the Engineer.

404.18 Basis of Payment. Payment for accepted quantities, complete in place, will be made at the contract price for:

Item	Unit	Description
404	Cubic meter (cubic yard)	Asphalt concrete

ITEM 407 TACK COAT

407.01 Description

407.02 Material

407.03 Equipment

407.04 Preparation of Surface

407.05 Application of Bituminous Material

407.051 Tacking Portland Cement Concrete or Brick Pavement

407.052 Tacking Asphalt Concrete Concrete Intermediate Course

407.06 Application of Cover Aggregate

407.07 Method of Measurement

407.08 Basis of Payment

407.01 Description. This work shall consist of preparing and treating a paved surface with bituminous material, and cover aggregate if required, in accordance with these specifications and in reasonably close conformity with the lines shown on the plans or established by the Engineer.

407.02 Material. The bituminous material shall meet the applicable requirements of 702 and shall be one of the following: 702.02 RC-70 or RC-250; 702.04 RS-1, SS-1, SS-1h, CRS-1, CSS-1 or CSS-1h; or 702.13. Cut-back asphalt 702.02 may only be used after September 15 and before May 15.

Cover aggregate shall conform to 703.06.

407.03 Equipment. Equipment shall consist of adequate cleaning equipment, spreader boxes, and bituminous distributors. Bituminous distributors shall be designed, equipped, maintained and operated so that bituminous material is applied at the specified rate per m² (square yard) with uniform pressure over the required width of application. The distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank. An accurate thermometer with a range covering the specified application temperature for bituminous material shall be mounted at approximately center height of the tank with the stem extending into the bituminous material. The distributor shall have a full-circulating system with a spray bar which is adjustable laterally and vertically. The spray bar shall be maintained at a constant height above the pavement under variable load conditions. Each distributor shall have suitable charts showing truck and pump speeds and other pertinent application data necessary to obtain the required results.

Distributors shall meet the following requirements: The actual application in L/m² (gallons per square yard) shall be determined by a check on the project. The application shall be considered satisfactory when the actual rate is within plus or minus 10 percent of the required rate and the material is applied uniformly with no visible evidence of streaking or ridging.

407.04 Preparation of Surface. The surface shall be thoroughly clean and dry when the bituminous material is applied.

Material cleaned from the surface shall be removed and disposed of as directed by the Engineer.

407.05 Application of Bituminous Material. The bituminous material shall be uniformly applied with a bituminous distributor. For irregular areas such as driveways and intersections, the method of application shall be approved by the Engineer.

The tack coat shall be applied in a manner that offers the least inconvenience to traffic and permits one-way traffic without pickup or tracking.

The bituminous material shall not be applied when the surface temperature is below the minimum placement temperature for the pavement course to be placed, as specified in 401.05.

The quantity, rate of application, temperature, and areas to be treated, shall be approved prior to application. The tack coat application shall be limited to areas that will be covered by a pavement course during the same day.

407.051 Tacking Portland Cement Concrete or Brick Pavement. Whenever asphalt concrete or bituminous aggregate base is paved directly onto portland cement concrete or brick pavement, the pavement shall be tacked with rubberized asphalt emulsion meeting 702.13.

407.052 Tacking Asphalt Concrete Intermediate Course. Prior to placing a surface course onto an intermediate course, the Contractor shall apply a tack coat on the intermediate course.

407.06 Application of Cover Aggregate. Immediately following the application of the bituminous material in areas which will be exposed to traffic, sufficiently dry cover aggregate shall be applied uniformly to form a bonded layer which, after curing, will not be picked up by traffic. Excessive application resulting in an unbonded layer of cover aggregate will not be accepted. The cover aggregate shall be included in the bid price for the tack coat.

407.07 Method of Measurement. Bituminous material will be measured by the liter (gallon) in accordance with 109.

407.08 Basis of Payment. Payment for accepted quantities complete in place will be made at the contract price for:

Item	Unit	Description
407	Liter (gallon)	Tack coat
407	Liter (gallon)	Tack coat for intermediate course

ITEM 607 FENCE

607.01 Description

607.02 Materials

607.03 Clearing and Grading

607.04 Post Assemblies

607.05 Horizontal Deflection

607.06 Line Posts

607.07 Fabric

607.08 Barbed Wire

607.09 Method of Measurement

607.10 Basis of Payment

607.01 Description. This work shall consist of furnishing and erecting fence and gates of the types designated, in reasonably close conformance with lines, grades and locations specified on the plans or established by the Engineer. Construction shall be accomplished in a manner that will provide a rigid, taut fence closely conforming to the surface of the ground.

Fence will be designated by the following types:

- (a) Type 47 (1195 mm (47-inch)) woven wire fence fabric with steel line posts)
- (b) Type 47RA (1195 mm (47-inch)) woven wire fence fabric with wood line posts)
- (c) Type CL (1525 mm (60-inch)) chain link fence fabric with top rail)
- (d) Type CLT (1525 mm (60-inch)) chain link fence fabric with tension wire)

607.02 Materials. Fence materials shall meet the following requirements:

Fence posts, braces and dimension lumber	710.11
Woven steel wire fence	710.02
Steel line posts and ties (Type 47 fence)	710.11
Barbed wire	710.01
Chain link fence	710.03
Reinforcing steel	509.02
Concrete (Class C, F or S)	499 and 511
Expansion shield anchors, self drilling	712.01

607.03 Clearing and Grading. The Contractor shall perform such clearing and grading as may be necessary to construct the fence to the required alignment and shall provide a reasonably smooth ground profile at the fence line.

607.04 Post Assemblies. End, corner, gate, and pull or intermediate anchor posts shall be securely braced in position during the curing period of the concrete encasement. Forms will not be required for post encasement. For Type 47 and Type CLT fence, the maximum spacing between intermediate anchor post assemblies, or between end post assemblies and intermediate anchor post assemblies, shall be 200 m (660 feet).

607.05 Horizontal Deflection. At points of horizontal deflection, construction shall be as follows:

(a) For Type 47 fence, either steel line posts encased in concrete or wood posts without encasement shall be installed at all horizontal deflection points where the fence changes alignment by more than 1 degree but not more than 4 degrees. Where the change in alignment is in excess of 4 degrees and less than 30 degrees, an intermediate anchor post assembly shall be built at the deflection point. If the change in alignment is 30 degrees or more, a corner post assembly shall be built at the deflection point.

(b) For Type CL fence, line posts encased in concrete shall be installed at all horizontal deflection points where the fence changes alignment by more than 1 degree but not more than 4 degrees. At points of deflection where the fence changes alignment by more than 5 degrees, a post brace and truss rod shall be provided in each fence panel adjacent to the post located at the angle point. The footings for all post located at points where the change in alignment exceeds 5 degrees shall be constructed as specified for end posts.

607.06 Line Posts. The setting of line posts shall conform to the following:

(a) For Type 47 fence, line posts shall be spaced at intervals not to exceed 3.6 m (12 feet). Line posts at the bottom of dips or depressions in the ground surface shall be anchored in concrete. Where channels or streams cross the fence line, crossings shall be as shown on the plans.

On tangents, line posts shall be placed so that the fabric, when installed on the side toward the highway, will be 0.6 m (2 feet) from the right-of-way line. Adjacent to right-of-way lines with less than 1750 m radius (in excess of 1 degree curvature), line posts shall be constructed on chords so that the fabric when installed on the side toward the highway, will be not less than 0.6 m (2 feet) or more than 2.4 m (8 feet) from the right-of-way line.

Posts at points of horizontal deflection shall be located so that the fence fabric will bear against the post.

(b) For Type CL fence, the tops of driven line posts shall be protected by drive caps or other method to prevent distortion of the exposed end. Line posts shall be spaced at not more than 3.0 m (10 foot) centers and shall be so placed that, when the wire is fastened on the side toward the highway, it shall be 0.3 m (1 foot) from the right-of-way line.

607.07 Fabric. When posts are set in concrete, the fabric shall not be erected until after five days from the time of setting the posts when regular cement is used, or until after three days when high-early-strength cement is used. Type 47 fabric shall be stretched and securely fastened to line posts using galvanized ties. The minimum number of ties shall be one each for top and bottom horizontal wire and one for each alternate horizontal wire below the top horizontal wire.

Chain link fabric shall be fastened to the line posts with clips or bands spaced approximately 0.4 m (14 inches) apart, and to the top rail or top tension wire with bands or tie wires at approximately 0.6 m (24 inch) intervals or less. Successive rolls of fabric shall be joined by weaving a single picket into the ends of the rolls to form a continuous mesh.

607.08 Barbed Wire. Where barbed wire is specified, it shall be stretched and fastened in the same manner as woven wire fabric.

607.09 Method of Measurement. Fence will be measured by the meter (linear foot), complete in place.

Measurement will be along the top of the fence from outside to outside of end posts, exclusive of gates and other openings.

Gates will be measured as complete units of the size and type specified.

607.10 Basis of Payment. The accepted quantities of fence and gates measured as provided above will be paid for under:

Item	Unit	Description
607	Meter (linear foot)	Fence, Type
607	Each	Gate, Type

Chapter 358

FENCE REGULATIONS

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MAR 13 2001

DIVISION OF BUILDING

358.01 Purpose
358.02 Definitions
358.03 Sight Lines
358.04 Fences in Residential Districts

358.05 Fences in Non-Residential Districts
358.06 General Regulations
358.07 Permit Requirements

358.01 Purpose

The regulations of this chapter are established to permit fences in a manner that promotes safety and security, while protecting and enhancing the appearance and character of neighborhoods and business districts.

358.02 Definitions

For the purpose of this Chapter, terms shall have the meaning given in the succeeding sections.

(a) **Fence.** An artificially constructed barrier of any material or materials erected to enclose, screen, or decorate areas of land. Fences include walls, hedges and earth berms meeting this definition.

(b) **Fence Height.** The height of a fence, as defined herein, measured from grade at the base of the fence.

(c) **Open and Solid Fences.** A fence shall be considered "open" if every segment of the fence (e.g., a section between posts) is composed of at least 75% open spaces and no more than 25% solid materials. All other fences are considered "solid" fences.

(d) **Ornamental Fence.** A fence shall be considered "ornamental" if it is composed of wrought iron-style pickets, wood pickets, wood split rails and posts, brick, stone, or any other materials of a decorative nature approved by the Director of the City Planning Commission as compatible with the character of the area in which the fence is to be placed.

(e) **Yards.** As used in this chapter, the term "actual yard" shall refer to the entire lot area between a main building and the corresponding

that portion of the actual yard in which structure cannot be erected unless permitted encroachments.

358.03 Sight Lines

No fence shall be installed or maintained except in conformance with the following regulation regarding maintenance of sight lines at street intersections and at driveway exits.

(a) **Height and Location.** No portion of a fence located within thirty (30) feet of the intersection of two street right-of-way lines shall exceed two and a half (2½) feet in height, unless all portions of the fence above two and a half (2½) feet in height are at least 75% open. The same restrictions shall apply to any portion of a fence located along and parallel to a driveway within fifteen (15) feet of its intersection with a public sidewalk or public street, if no sidewalk is present.

(b) **Nonconforming Fences.** Any fence not conforming to the regulations of this section regarding maintenance of sight lines shall be made to conform if the owner or responsible party is so ordered by the Commissioner of Building and Housing for the purpose of eliminating an identified and demonstrated hazard. The Board of Zoning Appeals may, however, permit retention or installation of such nonconforming fence if the Board determines that no hazard is created in a particular instance.

358.04 Fences in Residential Districts

Fences in Residential Districts shall be installed and maintained in accordance with the following regulations, as well as other applicable regulations of the Codified Ordinances.

(a) **Height and Opacity.** Fences in actual front yards and in actual side street yards shall not exceed four (4) feet in height and shall be at least 50% open, except that, in an actual side street yard, a fence that is set back at least four (4) feet from the side street property line may be a maximum of six (6) feet in height and may be open or solid. Fences in actual rear yards and in actual interior side yards shall not exceed six (6) feet in height and may be solid or open. No fence shall be higher than its distance from a residence building on an adjoining lot or from the permitted placement of a future residence on such lot, if such fence will be generally parallel to and adjacent to the closest wall of the residence.

(b) **Location.** A fence running generally parallel to and adjacent to a building on the same property shall be located no closer than three (3) feet to the closest wall of such building.

(c) **Materials and Appearance.**

(1) **Front Yards.** In Residential Districts, only ornamental fences, as defined herein, shall be installed in actual front yards and in actual side street yards if located within four (4) feet of the side street property line. The Board of Zoning Appeals may, however, permit a chain link fence if the Board determines that such fence is common in the immediate vicinity of the subject property.

(2) **Other Yards.** In other yards, fences may be composed of any material except barbed wire and except as prohibited in division (a) of Section 358.06.

(d) **Residential Swimming Pools.** Fences shall be provided around swimming pools that are accessory to a residence in accordance with the regulations of division (g) of Section 3117.03 of the Building Code.

358.05 Fences in Non-Residential Districts

Fences in Non-Residential Districts shall be installed and maintained in accordance with the following regulations, as well as other applicable regulations of the Codified Ordinances.

(a) **Height and Opacity**

(1) **General and Unrestricted Industrial Districts.** In General and Unrestricted Industrial Districts, fences in actual front yards and in actual side street yards shall not exceed six (6) feet in height and may be either open or solid. In actual rear yards and actual interior side yards, fences shall not exceed ten (10) feet in height and may be open or solid.

(2) **Other Non-Residential Districts.** Except as specifically required because of the type of use, in Non-Residential Districts other than General and Unrestricted Industrial Districts, fences in actual front yards and in side street yards shall not exceed four (4) feet in height and shall be at least 50% open above two (2) feet in height. In actual rear yards and actual interior side yards, fences shall not exceed six (6) feet in height and may be open or solid.

(b) **Barbed Wire Fences.** Barbed wire fences are permitted in all Non-Residential Districts except the Local Retail District and the Parking District, and shall be installed and maintained in accordance with the following regulations and other applicable regulations of the Codified Ordinances.

(1) **Sidewalk Setback.** Except in General Industrial and Unrestricted Industrial Districts, a fence with barbed wire shall be located at least four (4) feet from a sidewalk in a public right-of-way.

(2) **Residential Setback.** In all Non-Residential Districts, a fence with barbed wire shall be located at least four (4) feet from the property line of a Residential District.

(3) **Landscape Barrier.** Where it is required that a barbed wire fence be set back from a sidewalk or a Residential District line, such setback area shall be planted with shrubs spaced no more than five (5) feet apart or trees spaced no more than twenty (20) feet apart. The requirement for a landscape barrier shall not apply to barbed wire fences legally established prior to the initial effective date of this section nor to the replacement of such fences and shall not apply to a fence setback area of eight (8) feet or more.

358.06 General Regulations

The following regulations shall apply to fences in all zoning districts or as specified.

(a) **Prohibited Materials.** No fence shall be composed of scrap materials, tires, canvas, cardboard, asphalt-style shingles, or chicken wire. Furthermore, except in General Industry and Unrestricted Industry Districts, no fence shall be composed of corrugated metal or sheet metal.

(b) **Appearance.** All fences shall be uniform in material and color. In the case of a fence with a finished side and an unfinished side, the finished or more decorative side shall face outward toward the adjoining property or the street.

(c) **Barbed Wire.** Where permitted by regulations of this chapter, barbed wire may be installed at the top of a fence if not more than three (3) strands are used, and if the lowest strand is at least six (6) feet above the adjoining ground. In the case of a fence located less than four (4) feet from a public sidewalk or a Residential District line, the vertical supports for the strands shall slant away the nearest property line at an angle of not less than 45°. Such barbed wire may be placed above the otherwise applicable height limit for the fence to which it is attached. Any barbed wire fence not conforming to any provision of this chapter regarding barbed wire fences shall be made to conform or shall be removed no later than December 31, 2001.

(d) **Maintenance.** All fences shall be maintained in good condition, free of significant rust, peeling paint or other damage. Furthermore, all fences shall be kept plumb, with no more than a 2-inch deflection from a vertical position.

(e) **Recreation Facilities.** On the grounds of a school or on the grounds of a public or private recreation use, an open fence erected to enclose a playground, playfield, swimming pool, tennis court, golf course or similar facility may exceed the otherwise applicable height limits, but shall not exceed twelve (12) feet in height.

(f) **Railroad and Utility Properties.** An

railroad or rapid transit right-of-way or yard or around a public utility use may exceed the otherwise applicable height limits, but shall not exceed twelve (12) feet in height.

(g) **Temporary Construction Fences.** Notwithstanding other provisions of this chapter, a temporary fence shall be permitted in any zoning district to enclose a site at which construction activity is underway. Such fence shall be in place only for the duration of the construction activity and shall be removed when construction activity has been completed or has been discontinued for a period of three (3) months or more. Such fence shall be located as necessary to protect the public and to secure the construction site, as approved by the Commissioner of Building and Housing. The fence may be chain link, wood or another material approved by the Commissioner.

(h) **Nonconforming Fences.** Except as specified in division (b) of Section 358.03 with regard to sight lines and division (c) of Section 358.06, with respect to barbed wire, any fence not conforming to the regulations of this chapter may be retained and repaired but shall not be moved or replaced in whole unless made to conform. Replacement of less than half of a nonconforming fence in a twelve (12) month period shall be considered "repair" and not "replacement" for purposes of this provision.

358.07 Permit Requirements

(a) **Applicability.** Except as exempted in this section, no fence shall be installed unless a permit for such fence has been issued by the Commissioner of Building and Housing.

(b) **Contents of Application.** An application for a Building Permit to erect a fence shall include the following information, in addition to other information required by the Division of Building and Housing for a permit application:

(1) a site plan showing the location of the fence and gates in relation to all property lines, streets, driveways, sidewalks and structures on or within six (6) feet of the subject property;

(2) information indicating the height, materials, dimensions, colors, style and opacity

of the fence, including the use of barbed wire, if any; and

(3) information and plans indicating the method of attaching the fence to the ground or to other structures.

(c) Exemption for Repair or Replacement.

No permit is required for repair or replacement of a fence or portions thereof if the area being repaired or replaced, in any twelve-month period, does not exceed fifty percent (50%) of the length of the fence, and the replacement does not involve changes to foundations or footers. The exemption regarding partial replacement does not apply to walls.

← Post
Requires
Permit

ITEM 653 TOPSOIL FURNISHED AND PLACED

653.01 Description

653.02 Topsoil

653.03 Stripping Topsoil

653.04 Preparation of Subgrade

653.05 Placing and Spreading Topsoil

653.06 Method of Measurement

653.07 Basis of Payment

653.01 Description. This item shall consist of furnishing and spreading topsoil and preparing the subgrade for same.

653.02 Topsoil. The material shall consist of loose, friable, loamy topsoil without admixture of subsoil or refuse. For topsoil to be considered loamy, that fraction passing the 2.00 mm (No. 10) sieve shall contain not more than 40 percent clay.

Acceptable topsoil shall contain not less than 3 percent nor more than 20 percent organic matter as determined by loss on ignition of samples oven dried to constant weight at 100 C (212 F).

653.03 Stripping Topsoil. After approval of topsoil by the Engineer, and prior to stripping, the Contractor shall remove all grass, roots, brush, etc., from the area to be stripped.

653.04 Preparation of Subgrade. The Contractor shall complete all subgrading within the areas to be covered with topsoil under this item necessary to bring the surface of the proposed subgrade to the lines indicated on the plans, and parallel to the proposed finished grade. These areas are to be free from rock or other foreign material of 75 mm (3 inches) or greater in any dimension. The surface of the subgrade immediately prior to being covered with topsoil shall be raked or otherwise loosened to a depth of 25 mm (1 inch).

653.05 Placing and Spreading Topsoil. Topsoil shall be placed and spread over the areas designated to a depth sufficiently greater than that shown on the plans so that after natural settlement the completed work will conform to elevations shown on the plans.

653.06 Method of Measurement. Measurement shall be the number of cubic meters (cubic yards) measured by volume in carrier at work site.

653.07 Basis of Payment. Payment for accepted quantities will be made at contract price for:

Item	Unit	Description
653	Cubic meter (cubic yard)	Topsoil furnished and placed

ITEM 659 SEEDING AND MULCHING

659.01 Description

659.02 Agricultural Liming Materials

659.03 Commercial Fertilizer

659.04 Seeds

659.05 Inoculating Bacteria

659.06 Mulching Material

659.07 Inoculating Legumes

659.08 Fertilizing

659.09 Seeding and Mulching

659.10 Wildlife Seeding

659.11 Method of Measurement

659.12 Basis of Payment

659.01 Description. This item shall consist of furnishing all seed, agricultural liming materials, commercial fertilizer, mulching material, and water and placing and incorporating as specified; and mowing the resulting cover as directed. Seeding and mulching shall be performed in stages, per 108.04 and 207.

The areas to be seeded and paid for under this item shall include all areas designated by the Engineer within the right-of-way line and as described on the plans. All areas outside of specified limits where the vegetative growth has been injuriously disturbed or destroyed by the Contractor including those areas defined in 104.06 shall be restored and seeded in accordance with these specifications by the Contractor at no additional cost to the Department.

When the proposal contains an estimated quantity of "659 Repair Seeding and Mulching," such work shall be performed on damaged or eroded areas of seeding and mulching which have previously been acceptably completed, at the times and locations ordered by the Engineer.

A second application of commercial fertilizer at three quarters of the specified rate shall be applied to selected grass areas when and as ordered by the Engineer.

Commercial fertilizers and agricultural liming materials shall be obtained by the Contractor from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture.

659.02 Agricultural Liming Materials. For the basis of quality control agricultural ground limestone, with a minimum total neutralizing power (TNP) of 90 percent and at least 40 percent passing a 150 μm (No. 100) sieve, and at least 95 percent passing a 2.35 mm (No. 8) sieve, and with a 100 percent application rate of 256 kg/1000 m² (46 pounds per 1000 square feet) shall be standard grade. Other grades of agricultural liming materials will be applied at rates which are dependent on the total neutralizing power and fineness of the sample. These rates are determined from the table "Equivalent Amounts of Liming Materials" found in Bulletin 472, "Agronomy Guide", published by the Cooperative Extension Service, The Ohio State University.

No payment adjustment shall be made for the equivalent quantity required by the Agronomy Guide. The payment rate shall be based on the percentage of the standard in 659.08 or the rate stated in the

plans.

659.03 Commercial Fertilizer. Commercial fertilizer may be dry or liquid in analysis specified or in the same ratio as specified.

659.04 Seeds. All seeds specified shall meet the current specifications on file with the Department as to percentage purity, weed seed and germination.

All seeds proposed to be used under this item shall be on an approved list on file at the Laboratory, and shall meet the requirements of these specifications.

The Department reserves the right to test, reject or approve all seed after delivery on the project.

All seeds are to be furnished in separate varieties, separately packaged or bagged, and shall be labeled, tagged or marked in accordance with 907.03, ORC.

659.05 Inoculating Bacteria. The inoculant for treating leguminous seeds shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality, not more than one year old. All cultures shall be subject to the approval of the Engineer.

659.06 Mulching Material. Materials used for mulching shall be straw, hay or wood fiber. The material shall be reasonably free of weed seed and such foreign materials as may detract from their effectiveness as a mulch or injurious to desired plant growth.

659.07 Inoculating Legumes. All leguminous seeds shall be inoculated or treated with the proper amount of approved culture mixed with sufficient water to thoroughly wet the seed with the solution. When seed is sown hydraulically, four times the amount of inoculant required above shall be placed directly into the slurry and thoroughly mixed immediately before seeding. Seed shall be sown within 24 hours after treatment with the inoculant.

659.08 Fertilizing and Liming. The standard application of fertilizer shall be at the rate of 0.1 kg/m² (20 pounds per 1000 square feet) of 12-12-12. Another analysis, in the same ratio, may be used by varying the application rate to produce the same values specified. Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed or raked into the soil to a depth of not less than 50 mm (2 inches) unless otherwise directed by the Engineer.

When agricultural liming material is required, it shall be applied on the surface at 220 percent of the standard rate stated in 659.02, and thoroughly disked, harrowed or raked into the soil to a depth of not less than 50 mm (2 inches) unless otherwise directed by the Engineer.

Other agricultural liming materials may be used and the rate of application shall be varied according to the percent required of the standard rate of application specified under 659.02.

Fertilizer and liming materials when required shall be applied separately but can be disked or otherwise incorporated into the soil in the same operation. If the seed bed becomes compacted prior to seeding, it shall be redisked or loosened to a friable condition before seeding. If the fertilizer or lime has been washed or otherwise lost from the seed bed, the areas so depleted shall be retreated as directed by the Engineer at no cost to the project.

Areas of the project which were seeded and mulched during preceding seasons (three months or more) shall be refertilized. The fertilizer shall be applied to the surface without incorporation into soil at one half the normal rate. This operation shall be performed after repair seeding and mulching operations have been completed.

659.09 Seeding and Mulching. All areas with slopes less than 2 to 1 that are to be seeded shall be free of rock and other foreign material 75 mm (3 inches) or greater in any dimension and shall be satisfactorily shaped and finished as provided in 203. All areas with 2 to 1 slopes or steeper that are to be seeded shall be free of rock and foreign material 75 mm (3 inches) or greater in any dimension but shall not be fine graded. Areas in front of residences, between curb and sidewalks, and other areas indicated on the plans, shall be free of all stones 25 mm (1 inch) or greater in any dimension and shall have a smooth surface. In such areas, hand raking will be required if inaccessible to machines, and may be required if machines do not provide results equivalent to hand raking. Payment for the work necessary for proper preparation of the seed bed shall be included in the unit price for 203.

The seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of 25 g/m² (5 pounds per 1000 square feet). Seed shall be sown dry or hydraulically.

All areas to be seeded which are considered to be urban in character, and any area immediately in front of a residence, shall be seeded with the following mixture: (Percentages are by weight).

- 30 percent Kentucky Bluegrass (*Poa pratensis*)
- 30 percent Creeping Red Fescue (*Festuca rubra*)
- 20 percent Annual Ryegrass (*Lolium multiflorum*)
- 20 percent Perennial Ryegrass

All areas not urban in nature with slopes less than or equal to 3 to 1 shall be seeded with the following mixture:

- 30 percent Kentucky Bluegrass (*Poa pratensis*)
- 40 percent Kentucky 31 Fescue (*Festuca arundinacea* var. Ky. 31)
- 30 percent Perennial Ryegrass (*Lolium perenne*)

All areas with slopes greater than 3 to 1 to be seeded with Crown Vetch shall be seeded at a rate of 15 g/m² (3 pounds per 1000 square feet) with the following mixture:

- 30 percent Crown Vetch (*Coronilla varia*)
- 60 percent Perennial Ryegrass (*Lolium perenne*)
- 10 percent Annual Ryegrass

Immediately after sowing, the area shall be raked, dragged or otherwise treated so as to cover the seed to a depth of approximately 6 mm (1/4 inch).

The operation of seed sowing shall not be performed when the ground is frozen or muddy, or when the soil or weather conditions would prevent the proper soil preparation and subsequent operations as specified. All seeding performed between October 15 and March 15 shall be temporary seeding in accordance with 207. However, for projects which will be completed in the same calendar year, permanent seeding may be performed with permission of the Engineer. Sowing of Crown Vetch shall

not be permitted during September or October.

Seeding shall be done prior to or concurrently with 660, 667, 668 or 670.

Within 48 hours after any given area is seeded, vegetative mulch material conforming to 659.06 shall be evenly placed over all seeded areas at the rate of approximately $0.5 \text{ t}/1000 \text{ m}^2$ (2 tons per acre) for straw, or $0.7 \text{ t}/1000 \text{ m}^2$ (3 ton per acre) for hay, when seeding is performed between the dates of March 15 and October 15, and at the approximate rate of $0.7 \text{ t}/1000 \text{ m}^2$ (3 tons per acre) for straw, or $1.0 \text{ t}/1000 \text{ m}^2$ (4 1/2 tons per acre) for hay, when seeding is performed between the dates of October 15 and March 15 of the succeeding year.

Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 250 L/t (60 gallons per ton) of mulch or by methods approved by the Engineer with tackifiers as approved by the Laboratory. An additional application at a rate of 125 L/t (30 gallons per ton) of mulch shall be applied to the shoulder area, starting at the berm edge and extending out for a distance of 3 m (10 feet). Asphalt emulsion for vegetative mulch shall conform to 702.04. Emulsion shall be nontoxic to plants and shall be so prepared that it will not change in transportation or storage. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching and which work was damaged as a result of displacement of mulching material has been acceptably repaired.

The Contractor shall maintain all seeded and mulched areas until final inspection. Maintenance shall also include repairing any areas damaged following the seeding or mulching operation due to wind, water, fire or other causes. Such damaged areas shall be repaired to re-establish the condition and grade of the area prior to seeding and shall then be refertilized, reseeded and remulched as directed by the Engineer.

When an estimated quantity of "659 Repair Seeding and Mulching" is listed in the proposal, it is to provide for repair of damages or erosion where the regular seeding and mulching operations have been acceptably performed in stages on significant portions of the project. Such repairs of these areas shall be made at the direction of the Engineer when the damage or erosion is not due to fault or negligence of the Contractor. The repairs shall be made prior to completion of the project by reworking or reshaping to grade and then refertilizing, reseeding and mulching. Reworking or reshaping of slope shall include bringing in additional material, if necessary, and using whatever equipment is necessary to restore slopes to grade. Such work will be measured and paid for as "Repair Seeding and Mulching." When damage or erosion of these areas occurs as a result of the fault or negligence of the Contractor, the areas shall be satisfactorily repaired and refertilized, reseeded, and mulched at no additional cost to the State.

Unless otherwise directed by the Engineer, the seed bed shall be thoroughly watered, as soon as the seed is covered, at the rate of $5 \text{ m}^3/1000 \text{ m}^2$ (120 gallons per 1000 square feet). The water shall be applied by means of a hydro-seeder or a water tank under pressure with a nozzle that will produce a spray that will not dislodge the mulching material. A second water application shall be made no sooner than 7 days or later than 10 days after the first application, providing significant rainfall has not occurred within 7 days after the first application. When significant rainfall occurs within 7 days after the first application, the Engineer may delay or omit entirely the second application, depending on weather conditions. The rate of the second application shall be $5 \text{ m}^3/1000 \text{ m}^2$ (120 gallons per 1000 square feet). Water shall be measured and paid for separately.

Mowing of excess growth on seeded areas shall be performed when and as directed by the Engineer. The vegetation shall be cut to approximately 150 mm (6 inches) in height by acceptable methods.

659.10 Wildlife Seeding. When areas of the project are designated to be seeded for wildlife, the following mixture shall be used at the rate of 10 g/m² (2 pounds per 1000 square feet):

60 percent Brome grass (*Bromus inermis*).
 18 percent Red Clover (*Trifolium pratense*).
 22 percent Perennial Ryegrass (*Lolium perenne*).

659.11 Method of Measurement. Commercial fertilizer and agricultural liming to be paid for shall be the number of kilograms (tons) of each calculated to standard, furnished, spread and incorporated.

Seeding and mulching to be paid for shall be the number of square meters (square yards) of the area seeded and mulched in accordance with these specifications. In the measurement of seeding and mulching, no adjustment of the plan quantities or recalculation of the areas of seeding and mulching shall be made for any areas found different by less than five percent from the plan quantity. The Contractor shall accept the plan quantity with authorized changes as payment in full unless revised by the Engineer. The burden of proof of a plan discrepancy greater than five percent is on the Contractor. The Contractor shall submit supporting documentation concerning the possible changes.

Repair seeding and mulching to be paid for shall be the number of square meters (square yards) of damaged or eroded areas reshaped, seeded, and mulched at the direction of the Engineer on portions of the project where seeding and mulching had previously been acceptably completed and where the damage was due to no fault or negligence of the Contractor. The quantity of water shall be the amount in cubic meters (thousands of gallons) applied in accordance with the requirements of this item and measured in tanks, tank wagons or trucks of predetermined capacity, or by means of meters of a type satisfactory to the Engineer and furnished and installed by the Contractor at his own expense, or determined by weight conversion.

Mowing satisfactorily performed at the direction of the Engineer will be measured in square meters (1000 square foot units).

659.12 Basis of Payment . Payment for accepted quantities will be made at contract prices for:

Item	Unit	Description
659	Kilogram (ton)	Commercial fertilizer
659	Kilogram (ton)	Agricultural liming
659	Square meter (square yard)	Seeding and mulching
659	Square meter (square yard)	Seeding and mulching for wildlife
659	Square meter (square yard)	Repair seeding and mulching
659	Cubic meter (M gallons)	Water
659	Square meter (M square feet)	Mowing

700 Material Details

Materials shall conform to the stated requirements and/or the requirements of the referenced specifications including modifications as noted

Group 0 and Group 1 Aggregate and Aggregate Soil mixtures

Group 0, and 1 Materials Coarse aggregate

Group 0, and 1 Materials Fine aggregate

Group 2 Materials Fine aggregate

Group 2 Materials Coarse aggregate

Agricultural Limestone

Bearing Pads

Bituminous Concrete

Bituminous Materials

Bituminous Pipe Joint Filler

Bolts

Borrow

Brick

Bronze

Calcium Chloride

Castings, iron or steel

Cement, hydraulic

Chemical Admixtures for Concrete

Concrete Beams

Concrete Curing Agents

Concrete Cylinders Structures

Concrete Masonry Blocks

Copper, sheet

Delineators

Embankments

Expansion Shield Anchors

Fence

Fly Ash

Gear Lubricant

Glass Beads

Grease, Multipurpose

Guardrail and Fittings

Hook Bolts

Hydrated Lime

Joint filler

Lead, sheet

Linseed Oil, Turpentine and Petroleum Spirits

Lubricating Oil

Matting for Seeding

Paint

Pipe

Preservative Treatment for Lumber

Sodium Chloride

Steel Reinforcement- Billet, Rail, Axle

Steel Reinforcement Rod

Steel, Prestressing Strand

Steel Tubing

Structural Steel

Tie Bar

Topsoil

Water

Waterproofing Fabric

Group 0 and Group 1 Aggregate and Aggregate Soil mixtures

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Group 0 and Group 1 Aggregate and Aggregate Soil mixtures	The initial sample from each stockpile representing 1640t (1800 tons) or 2360t (2600 tons) or 4720t (5200 tons) or fraction thereof shall have a sieve analysis performed, up to three subsequent samples that do not require any additional quantitative or tests and meet all the requirements of their intended use will be permitted to represent 1640t (1800 tons) or 2360t (2600 tons) or 4720t (5200 tons) or fraction thereof, using the sieve analysis results of initial sample. Such subsequent samples shall represent only material from the same stockpile and shall have the same sample date as the initial sample. qualitative		

Group 0, and 1 Materials Coarse aggregate

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Group 0, and 1 Materials Coarse aggregate	<u>703.02, 703.08</u>	Each 2360 t (2600 tons) or fraction thereof	
		Sizes Nos. 1, 2 & 24	27-32 kg (60-70 pounds)
		Sizes Nos. 3 thru 10	45 kg (100 lbs.)
	<u>703.04, 703.05, 703.10</u>	Each 4720 t (5200 tons) or fraction thereof	
		Sizes Nos. 3 thru 10	27-32 kg (60-70 pounds)
		Sizes Nos. 1, 2 & 24	45 kg (100 lbs.)

Group 0, and 1 Materials Fine aggregate

Group 0, and 1 Materials Fine aggregate	<u>703.02, 703.03</u>	Each 1640 t (1800 tons) or fraction thereof	14-18 kg (30-40 pound)
	<u>703.04, 703.05, 703.06</u>	Each 4720 t (5200 tons) or fraction thereof	14-18 kg (30-40 pound)

Group 2 Materials Fine aggregate

Group 2 Materials Fine aggregate	<u>703.02, 703.03, 703.04, 703.05, 703.06</u>	Each 1640 t (1800 tons) or fraction thereof	14-18 kg (30-40 pounds)
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Group 2 Materials Coarse aggregate

Group 2 Materials Coarse aggregate	<u>703.02, 703.04, 703.05, 703.10</u>	Each 2360 t (2600 tons) or fraction thereof	
		Sizes Nos. 3 thru 10	27-32 kg (60-70 pounds)
		Sizes Nos. 1, 2 & 24	45 kg (100 lbs.)

Group 0, 1, and 2 Materials Aggregate base

Group 0, 1, and 2 Materials Aggregate base	<u>304.02</u>	Each 4720 t (5200 tons) or fraction thereof	32 kg (70 pounds)
Stabilized crushed aggregate	<u>411.02, 617.03</u>	Each 4720 t (5200 tons) or fraction thereof	32 kg (70 pounds)
Traffic compacted surface	<u>410.02</u>	Each 4720 t (5200 tons)	27-32 kg (60-70 pounds)

		or fraction thereof	
Backfill	<u>518.02, 603.02, 605.03</u>	Each 4720 t (5200 tons) or fraction thereof	32 kg (70 pounds)
Mineral filler	<u>703.07</u>	First shipment, each company	2 L (1/2 gallon)

Agricultural limestone

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Agricultural limestone	<u>659.02</u>	First shipment, each company	1 L (1 quar

Bearing pads:

Bearing pads: preformed and elastometric	<u>711.21</u>	Each shipment, each thickness	One piece, 150 x 150 mm (6 x 6 inch).
	<u>711.23</u>	Each shipment, each thickness	Certified or mill certificate for steel and test requirements described in 711.23.

Bituminous concrete

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Bituminous concrete	<u>301, 402, 403, 404, 412</u>	Field inspected and tested: one for each time interval designated by the schedule established by the Central Laboratory	2.0 - 2.5 kg (4-5 pound) briquette
	<u>301, 402, 403, 404, 405, 412</u>	Not field inspected and tested: a minimum of one sample for each purchase order. Where the purchase order exceeds 450 t (500 tons), one sample for each 450 t (500 tons) except where more than 450 t (500 tons) is produced in one day, one sample for each day's production, or use procedure outlined in SOP PH-C-302.	1L(32oz.)tin filled or 2.0-2.5 kg (4-5 pound) briquette

Bituminous materials

Material	Specifi- cation Section Number	Quantity Represented by Sample	Size of Sample
Bituminous materials	<u>702.01</u>	Certified asphalt cement: At refinery, random sample as directed by the Laboratory. At bituminous concrete plant, one sample for each project, except for inconsequential quantities.	0.5 L (1 pint)
		Non-certified asphalt must be sampled and approved by the Department before use.	0.5 L (1 pint)
	<u>702.02, 702.03, 702.04, 702.05, 702.06, 702.10, 702.11</u>	Field or plant storage each tank. Not inspected at refinery: each tank car, tank truck, distributor and shipment of packages. Inspected at refinery or certified: as directed by the Laboratory	Solid or semi-solid 0.5 L (1 pint) Liquids 1 L (1 quart)

Bituminous pipe joint filler

Bituminous pipe joint filler	<u>706.10</u>	Each batch No. or lot No. in shipment	0.5 L (1 pint)
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Bolts

Bolts, high-strength steel, nuts & washers	711.09	150 or less each dia., each length	2 bolts, nuts and washers
		151 to 280 each dia., each length	3 bolts, nuts and washers
		281 to 500 each dia., each length	4 bolts, nuts and washers
		501 to 1200 each dia., each length	6 bolts, nuts and washers
Bolts, high-strength steel, nuts & washers	711.09	1201 to 3200 each dia., each length	9 bolts, nuts and washers
		3201 to 10,000 each dia., each length	14 bolts, nuts and washers
		3201 to 10,000 each dia., each length	14 bolts, nuts and washers
		10,001 and over each dia., each length	21 bolts, nuts and washers
Note: The Size of Sample shall be increased 3 bolts, nuts and washers when the material is galvanized. Where production lot data is available the Size of Sample may be based on the production lot method. Certified test data or proof of domestic origin shall be submitted.			

Borrow

Borrow	203.03	Sampled only when requested by the Engineer	Soil, 9 kg (20 pounds) Granular material, 18 kg (40 pounds) 12 brick each size
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Brick

Brick, clay or shale, and concrete	704.01 and 704.02	First 10,000 units or fraction thereof, subsequently each 50,000 units.	12 brick each size
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Bronze

Bronze, phosphor, cast and leaded	711.16, 711.17, 711.18	When requested by Office of Structural Engineering
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Calcium chloride

Calcium chloride	712.02	Each shipment	Solid: 0.5 L (1 pint) Liquid: 1 L (1 quart)
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Castings, iron or steel

Castings, iron or steel.	711.07.	For bridges: When requested by the Office of Structural Engineering Other: Each lot of castings	Test bars, coupons, and certification referencing the casting to a particular date of test bar if the casting is not marked.
	711.12,		
	711.13.		
	711.13		
	711.13		

Cement, hydraulic

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Cement, hydraulic		Certified Cement: Each 600 t (600 tons) used with a minimum of one sample per calendar month, per concrete plan.	2 L (1/2 gallon)
	701.01 through 701.06, 701.08	Non-Certified Cement: Each 100 t (100 tons) or fraction thereof from cars or trucks.	2 L (1/2 gallon)
		Partial Plant Inspection: Each (100 t 100 tons) or fraction thereof from cars and trucks.	2 L (1/2 gallon)
	701.07	Each 1000 bags or fraction thereof.	4 L (1 gallon)

Chemical admixtures for concrete

Chemical admixtures for concrete	705.12	Liquid 10 000 L (2500 gals.) Dry 2 t (2 tons) Each shipment, each material, each company	0.5 L (plastic container) (1 pint)
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Concrete beams

Concrete beams	305, 451, 452, 453	6500 m2 (7500 sq. yds.) or less	Two beams
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Concrete curing agents

Concrete curing agents	705.05, 705.06, 705.07	Each shipment, each material, each company	Liquids 0.5 L (1 pint) Paper, polyethylene sheeting, burlap or plastic coated burlap blankets, 1 piece 1.0 x 1.0 m (4 x 4 ft.)
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Concrete cylinders Structures

Concrete cylinders Structures	499 & 511	Over 6.1 m (20 ft.) span, each day, each 150 m3 (200 cu. yd.) or less. 6.1 m (20 ft.) span and under, each 40 m3 (50 cu. yd.) or less.	2 cylinders
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Concrete masonry blocks

Concrete masonry blocks	704.03	First 10,000 units or fraction thereof subseq. ea. 50,000 units.	10 pieces, each type.
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Copper, sheet

Copper, sheet	711.15	Each shipment, each thickness.	1 piece, 300 x 300 mm
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Delineators

Delineators	720	When requested by Laboratory	5 units each type
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Embankment

Embankment	203, 503	Sampled only when requested by the Engineer	Soil, 9 kg (20 pounds) Granular material, 18 kg (40 pounds)
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Expansion shield anchors

Expansion shield anchors	712.01	Each shipment, each size.	3 of each size and certified test data; documented proof of domestic origin.
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Fence

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Barbed wire	710.01	Each 50 rolls or fraction thereof	1 piece 1.0 m (3 ft.) long*
Steel woven wire fabric	710.02	Each 50 rolls or fraction thereof	1 piece 1.0 m (3 ft.) long full height*
Posts	710.11	Each shipment	3 for each 1000 or smaller quantity*
Chain-link fabric	710.03	Each 50 rolls or fraction thereof	1 piece, 0.3 m (1 ft.) long, full height from each of two rolls, plus certified copies of chemical and physical properties of the fabric.*
Steel pipe-post, top rail, etc.	710.03	Each shipment	2 pieces, unthreaded, one 100 mm (4 in.) long from one end, the other 1.0 m (3 ft.) long

			from the opposite end.*
Hardware and fittings	<u>710.02</u> <u>710.03</u>	As directed by the Laboratory*	
Aluminum alloy posts, hardware,	<u>710.03</u>	Certified test results on each component from each producer.	For posts: 2 pieces, unthreaded, one 100 mm (4 in.) long from one end, the other 1.0 m (3 ft.) long from the opposite end.* For hardware and fittings: certified copies of the chemical and physical properties.
*Documented proof of domestic origin.			

Fly ash

Fly ash	<u>705.13</u>	Certified Fly Ash: 600 t (600 tons) minimum of one sample per calendar month, or per project.-	2 L (1/2 gallon)
		Non Certified Fly Ash: Each 100 t (100 tons) or fraction thereof from cars or trucks.	2 L (1/2 gallon)
		Partial Plant Inspection: Each 100 t (100 tons) or fraction thereof from cars and trucks.	2 L (1/2 gallon)

Gear lubricant

Gear lubricant	Each shipment, each grade	1 L (1 quart)
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Glass beads

Glass beads	<u>740.10</u>	Each shipment	4 L (1 gallon) split from 3 bags, each bag from randomly selected racks.
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Grease, multipurpose

Grease, multipurpose		Each shipment, each grade	1 L (1 quart)
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Guardrail and fittings

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Guardrail and fittings Rail: deep beam	<u>710.06</u>	Each heat number, each coating identification	3 pieces 0.3 m (12 inches) long from a single rail element, one from each end and one from the center (See 710.06 paragraph number 5.2.1)* 5 ea. nuts, bolts, and washers; 2 ea. other joint and post hardware*
Guardrail and fittings Wire rope	<u>710.09</u>	Each shipment	1 piece 8.0 m (15 ft.) long and 2 complete sets of hardware for attachment.*
Guardrail and fittings Anchor rods or brace rods including nuts, washers, bearing plates and turn buckles.	<u>710.06</u> , <u>710.09</u>	Each 6 000 m (20,000 ft.) of guardrail or fraction thereof	anchor rod or brace rod assembly.*

*Documented proof of domestic origin.

Hook bolts

Hook bolts	Std. Drawing BP-3	Each 12,000 units or less	H2 units; documented proof of domestic origin
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Hydrated lime

Hydrated lime	<u>712.04</u>	First shipment, each company, per project	4 L (1 gallon)
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Joint filler

Joint filler, preformed	<u>705.03</u>	Each 100 m ² (1,000 sq.ft.) or fraction thereof, each producer, each thickness	1 piece, full width, 1.0 m (3 ft.) long
Joint sealer-hot poured	<u>705.04</u>	Each batch No. or Lot No. in shipment	4.5 kg (10 lbs.)
Joint sealer, performed elastomeric	<u>705.11</u>	Each lot, each design	1 piece, 1.0 m (3 ft.) long and certified test data

Lead, sheet

Lead, sheet	<u>711.19</u>	When requested by Bureau of Bridges	
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Linseed oil, turpentine and petroleum spirits

Linseed oil, turpentine and petroleum spirits	<u>708</u>	Each shipment	1 L (1 quart)
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Lubricating oil

Lubricating oil		Each shipment, each grade	1 L (1 quart)
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Matting for seeding

Jute matting	<u>667</u>	One sample each 100 rolls, each company	1 piece, 1.5 m (4 ft.) long, full width of roll
Excelsior matting	<u>668</u>		

Paint

Paint	<u>708</u>	Each batch, each component	Two 0.5 L (1 pint) metal friction-top cans per batch per component.
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Pipe

Material	Specification Section Number	Quantity Represented by Sample	Size of Sample
Pipe-corrugated polyethylene	<u>707.15</u>	Each shipping lot of each size.**	One piece 3.0 m (10 feet) long from each of three reels and certified test data
Pipe-corrugated metal	<u>707.01, 707.02, 707.05, 707.07, 707.09, 707.11, 707.13, 707.14, 707.21, 707.22</u>	Certified Metal Pipe: Each heat or coil, with a minimum of one sample per calendar month, or one sample per project.**	If saw cut, 1 piece 250x250 mm (10 x 10 inch) If flame cut, 1 piece 300 x 300 mm (12 x 12 inch).*
		Noncertified Metal Pipe: Each size, each heat or coil, each shipment, each company.**	If saw cut, 1 piece 250x250 mm (10 x 10 inch). If flame cut, 1 piece 300 x 300 mm (12 x 12 inch).*
Pipe-structural plate corrugated structures	<u>707.03, 707.23</u>	Certified Metal Pipe: Each heat or coil, with a minimum of one sample per calendar month, or one sample per project.**	If saw cut, 1 piece 250x250 mm (10 x 10 inch). If flame cut, 1 piece 300 x 300 mm (12 x 12 inch) plus 5 bolts and 5 nuts.*

		Noncertified Metal Pipe: Each size, each heat or coil, each shipment, each company.**	If saw cut, 1 piece 250x250 mm (10x1 If flame cut, 1 piece 300x 300 mm (12 x inch) plus 5 bolts and 5 nuts.*
Pipe-clay and concrete drain tile	<u>706.07</u> and <u>706.09</u>	First 1000 tile or fraction thereof. Subsequently each 2000 tile or fraction thereof.**	5 tile, each diameter
Pipe-vitrified clay, non- reinforced		First 400 pipe or fraction thereof.**	2 pipe, each diameter or span
concrete, reinforced concrete	<u>706.01</u> , <u>706.02</u> , <u>706.04</u> ,	Each subsequent 400 pipe or fraction thereof	1 pipe, each diameter or span
and reinforced concrete elliptical less than 24 inch in diameter or span.	<u>706.06</u> and <u>706.08</u>	Pipe accepted under ASTM C 655, Table 2 of ASTM C 655 applies	ASTM C 655 Requirements
*Documented proof of domestic origin			
**Sample not required, unless requested on quantities as follows: Diameters less than 600 mm (24 in.) less than 30 m (100 ft.); diameters 600 to 900 mm (24 to 36 in.) incl. less than 25 m (75 ft.); diameters over 900 to 1500 mm (36 to 60 in.) incl. less than 15 (50 ft.); diameters over 1500 mm less than 8 m (25 ft.).			
Pipe-vitrified clay, non- reinforced concrete, reinforced concrete and reinforced concrete elliptical 600 mm (24 inch) in diameter or span and over.	<u>706.01</u> , <u>706.02</u> , <u>706.04</u> , <u>706.06</u> and <u>706.08</u>	Each 400 pipe or fraction thereof.**	1 pipe, each diameter or span
		Pipe accepted under ASTM C 655M (C 655) Table 2 of ASTM C 665 applies	ASTM C 655M (C 655) Requirements
Pipe-welded and seamless steel.	<u>748.06</u>	Each shipment, each diameter	Two pieces, 1.0 m (30 inches) long from same length, one from each end. Certified data or documented proof of domestic orig

Preservative treatment for lumber.

Preservative treatment for lumber.	<u>712.06</u>	The total amount of preservative required for each lot of lumber treated.	1 L (1 quart)
**Sample not required, unless requested on quantities as follows: Diameters less than 600 mm (24 in.) less than 30 m (100 ft.); diameters 600 to 900 mm (24 to 36 in.) incl. less than 25 m (75 ft.); diameters over 900 to 1500 mm (36 to 60 in.) incl. less than 15 m (50 ft.); diameters over 1500 mm less than 8 m (25 ft.).			

Sodium chloride

Sodium chloride	<u>712.03</u>	Each Purchase Order	0.5 L (1 pint)
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Steel reinforcement

Steel reinforcement- billet, rail, axle,	<u>709.01</u> through <u>709.05</u>	Each size, each heat number. Where heat number is not available, each size, each 10t(10tons) or less.	No. 35M (No. 11) and smaller: 2 pieces 1.0m (30 in.) long.* No. 45M and No. 55M (No. 14 and No. 18): 1 piece 1.0 m (30 in.) long.*
wire	<u>709.08</u> , <u>709.11</u>	Each size, each 10t(10tons) or less.	2 pieces 1.0 m (30 in.) long*
wire fabric	<u>709.10</u> , <u>709.12</u>	Each 7000 m2 (75,000 sq. ft.) or fraction thereof.	1 piece 0.5 m (18 in.) long full width of sheet or roll. Two transverse wires must be included.*
*Documented proof of domestic origin.			

Steel reinforcement rod mats

Steel reinforcement rod mats	<u>709.0</u> <u>9</u>	Mats-each 500 mats or less	1 piece 1.0x1.0m (3x3ft.) minimum sample, 2 pieces; documented proof of domestic origin.
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Steel, prestressing strand

Steel, prestressing strand	<u>711.2</u> <u>7</u>	Each reel, each size	1 piece 3.0 m (10 ft.) long; certified mill tests and documented proof of domestic origin.
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Steel tubing

Steel tubing	<u>707.</u> <u>10</u>	Each shipment, each size, each heat.	1 piece, 0.6m (2ft.) long; 3 pieces 50 x 225 mm (2 x 9 in.) long; certified mill tests and documented proof of domestic origin.
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Structural steel

Structural steel	<u>711.01</u>	Sampled only on request of Bureau of Bridges.	
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Tie bars

Tie bars	Std. Drawing BP-3	Each 10 t (10 tons) or less	1 bar*
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Topsoil

Topsoil	<u>653.02</u>	Each source of supply	0.5 L (1 pint)
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Water

Water	<u>499.02</u>	Each source of doubtful quality.	4 L (1 gallon) (plastic container)
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Waterproofing fabric

Waterproofing fabric	<u>711.24</u>	Each shipment, each company.	1 piece, 1.0 m (3 feet) long, full width of roll
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701 HYDRAULIC CEMENT

701.01 Air-entraining Portland Cement.

701.02 Portland Cement.

701.03 Air-Entraining Portland Blast-furnace Slag Cement.

701.04 Portland Cement.

701.05 High-Early-Strength Portland Cement

701.06 Portland Blast-Furnace Slag Cement.

701.07 Masonry Cement.

701.08 Expansive Hydraulic Cement.

Acceptance: Cements meeting the requirements of 701.01, 701.02, 701.03, 701.04, 701.05, 701.06, 701.08, 701.09, and 701.10 may be accepted, for shipment to and immediate use in construction projects, by cement manufacturer's certification, at the option of the contractor in lieu of sampling by Departmental Inspectors at manufacturing plants, when requested by a cement manufacturer and agreed to by both the requesting cement manufacturer and the Department. The procedure for this type of acceptance is set forth in Supplement 1028 on file in the Office of the Director.

701.01 Air-entraining Portland Cement. ASTM C 150, Type IA. The Gillmore time of set and the air-permeability (fineness) tests shall govern.

701.02 Portland Cement. ASTM C 150, Type II. The Gillmore time of set and the air-permeability (fineness) test shall govern. This cement may be used provided 705.10 Admixture is added at the mixer.

701.03 Air-Entraining Portland Blast-furnace Slag Cement. ASTM C 595, Type IS-A. The amount retained when wet sieved on 45 μ m (No. 325) sieve shall govern.

701.04 Portland Cement. ASTM C 150, Type 1. The Gillmore time of set and the air-permeability (fineness) test shall govern. This cement may be used provided 705.10 Admixture is added at the mixer.

701.05 High-Early-Strength Portland Cement. ASTM C 150, Type III. The Gillmore time set shall govern. This cement may be used provided 705.10 Admixture is added at the mixer.

701.06 Portland Blast-Furnace Slag Cement. ASTM C 595, Type IS. The amount retained when wet sieved on 45 μ m (No. 325) sieve shall govern. This cement may be used provided 705.10 Admixture is added at the mixer.

701.07 Masonry Cement. ASTM C 91.

701.08 Expansive Hydraulic Cement. ASTM C 845, Type K.

702 BITUMINOUS MATERIAL

Acceptance: Asphalt cements meeting the requirements of 702.01 and liquid asphalts 702.02, 702.03 and 702.04 may be acceptable for shipment to and immediate use in construction projects by asphalt manufacturer's certification, at the option of the Contractor in lieu of sampling by Departmental Inspectors at manufacturing plants, when requested by an asphalt manufacturer and agreed to by both the requesting asphalt manufacturer and the department. The procedure for this type of acceptance is set forth in Supplement 1032 on file in the Office of the Director.

702.00 Application Temperatures.

702.01 Asphalt Cements

702.02 Cut-Back Asphalt.

702.03 Cut-Back Asphalt Emulsions.

702.04 Emulsified Asphalts.

702.05 Asphalt Primer for Waterproofing

702.06 Asphalt for Waterproofing.

702.07 Asphalt Emulsion MWS

702.10 Creosote for Priming Coat

702.11 Coal-Tar Pitch for Waterproofing.

702.12 Premixed Patching Material

702.13 Rubberized Asphalt Emulsion.

702.14 Rubber Compound.

702.00 Application Temperatures. Bituminous materials for the several applications in the specifications shall be applied within the temperature ranges indicated in the following table.

Type and Grade of Material	Application Temperature, Range, C (F)	
	Spray	Mix
RT 1-2-3	16-54 (60-130)	---
RT 4-5-6	29-66 (85-150)	29-66 (85-150)
RT 7-8-9	66-107 (150-225)	66-107 (150-225)
RT 10-11-12	79-121 (175-250)	79-121 (175-250)
RC-70	24-66 (75-150)	----
RC-250	38-79 (100-175)	27-66 (80-150)
RC-800	66-107 (150-225)	66-93 (150-200)
RC-3000	93-135 (200-275)	79-107 (175-225)
MC-30	10-49 (50-120)	----
MC-70	24-66 (75-150)	----
MC-250	38-107 (100-225)	38-107 (100-225)
MC-800	66-121 (150-250)	66-107 (150-225)
MC-3000	107-135 (225-275)	93-121 (200-250)
All Emulsions	10-71 (50-160)	10-60 (50-140)
Creosote for Priming Coat	10-27 (50-80)	----
Coal-Tar Pitch	121-177 (250-350)	----
Asphalt Primer for Waterproofing	10-27 (50-80)	----
Asphalt for Waterproofing	149-177	----

	(300-350)	
CBAE 350, CBAE 350 Sp.	38-66 (100-150)	38-66 (100-150)
CBAE 800, CBAE 800 Sp.	52-79 (125-175)	52-79 (125-175)
Primer 20	16-49 (60-120)	----
Primer 100	24-52 (75-125)	----
Asphalt Cements	177 (350) Max.	163 (325) Max.
Asphalt Cement-Polymer modified with SB, SBR, or SBS	----	170(350) Max

702.01 Asphalt Cements. AASHTO Provisional Standard MP1 or any superseding AASHTO specification for performance graded asphalt cement binder.

702.02 Cut-Back Asphalt. Rapid curing, AASHTO M 81, medium curing AASHTO M 82. In lieu of viscosity on the residue, the penetration in note 3 (AASHTO M 81) or note 4 (AASHTO M 82) shall govern.

702.03 Cut-Back Asphalt Emulsions. These emulsions shall be prepared by compounding a suitable volatile solvent and water with 702.01 asphalt to produce emulsions meeting requirements of the following table.

	CBAE-350	CBAE-350 Special	CBAE-800	CBAE-800 Special	Primer 20	Primer 100
Kinematic Viscosity at 60 C, Centi stokes	350-700	350-700	800-1600	800-1600	20-40	100-200
Water Content, **%	4-12	4-12	4-12	4-12	3-8	3-8
Volatile Solvent, **%	12-25	12-25	10-20	10-20		
Asphalt Content, **%	67+	67+	72+	72-	45+	60-
Adhesion Test*	**	**	**	**		
Wet Stone Coating Test*		**		**	**	**
Stripping Test*		**		**		
Tests on Residue From Distillation						
Penetration at 25 C	80-150	80-150	80-150	80-150	100-200	100-200
Ductility at 25 C., in cm	100+	100+	100+	100+	100+	100+
Total Bitumen (Sol. in CSx), %	99+	99+	99+	99+	99+	99+
* These tests shall be in accordance with Supplement 1014 on file in the Office of the Director.						
** Shall meet						

702.04 Emulsified Asphalts. AASHTO M 140 or AASHTO M 208.

702.05 Asphalt Primer for Waterproofing. ASTM D 41.

702.06 Asphalt for Waterproofing. ASTM D 449, Type II.

702.07 Asphalt Emulsion MWS. Asphalt emulsion MWS shall be prepared from a base material conforming to 702.01 except that the penetration may be varied to meet the float test and penetration specified below. The emulsion shall coat aggregate readily, thoroughly and uniformly. The specified characteristics shall not change during transportation or normal storage and the emulsion shall conform to the following when tested in accordance with AASHTO T 59:

Saybolt furol viscosity at 25°C (77°F), seconds	50+ (a)
Asphalt residue, percent	68+
Settlement, 7 days, percent	5-
Sieve test	0.1-
Coating test	(b)
Oil distillate, percent	7-
Shall withstand freezing	(c)
Particle charge	Negative
Penetration, 25°C (77°F) (f)	(d)
Float test at 60°C (140°F), seconds (f) 1200+	(e)
Total bitumen soluble CS ₂ (f)	97.5+
Ash content, percent (f)	2.0-

(a) Pumpable

(b) Aggregates used to test the emulsion shall be from sources standardized by the Laboratory. They shall consist of 100 percent passing a 9.5 mm (3/8 inch) sieve and 0 percent passing a 6.3 mm (1/4 inch) sieve. The standard reference aggregates shall be washed with distilled water until free of dust, and dried.

93 grams (3.280 ounces) of the dry graded reference aggregate shall be weighed into a suitable container. 7 grams (0.247 ounces) of the emulsion shall be weighed onto the aggregate in the container and the contents mixed vigorously for 5 minutes. At the end of this mixing period the stone shall be thoroughly coated. The mixture shall then be completely immersed in tap water and the tap water shall immediately be poured off. The aggregate surface area shall be at least 90 percent coated.

(c) To -23°C (-10°F) when shipped after October 1 and before April 15, except when the emulsion is stored and mixed at temperatures of emulsion, aggregate and atmosphere above 5°C (40°F).

(d) The penetration may be selected within the following ranges of the designation indicated:

Designation	Penetration at 25°C (77°F)
MWS 300	300+
MWS 150	150-300
MWS 90	90-150
MWS 60	60-90

(e) AASHTO T 50 except that residue from distillation shall be poured immediately into the float collar at 260°C (500°F); or if the residue has been allowed to cool, it shall be heated again to 260°C (500°F) and poured into the float collar.

(f) Test on residue from distillation

702.10 Creosote for Priming Coat. AASHTO M 121.

702.11 Coal-Tar Pitch for Waterproofing. AASHTO M 118, Type II, except that the softening point shall be determined by the Ring and Ball Method.

702.12 Premixed Patching Material. This item shall be a bituminous patching material of a composition suitable for premixing, stockpiling and storage prior to use and shall meet the following requirements.

The aggregates shall be of a grading such that the specified composition will be obtained. A single aggregate or a blend of coarse and fine aggregates may be used. That portion of the aggregate retained on a 4.75 mm (No. 4) sieve shall meet the requirements of 703.05 Coarse Aggregate with a maximum loss in the sodium sulfate soundness test of 15 percent. For slag the unit weight shall be not less than 1120 kg/m³ (70 pounds per cubic foot). That portion of the aggregate passing the 4.75 mm (No. 4) sieve shall conform to the requirements of paragraphs 1 and 3 of 703.05 Fine Aggregate.

Bituminous materials shall be 702.02 MC-800, 702.03 CBAE-350 or CBAE-800, 902 MSC-3 or MSA-3, or 923 MWS.

702.01 AC (85-100) in conjunction with 702.08 Liquefier may also be used.

The completed mixture shall have a composition as directed by the Engineer within the following limits:

Sieve	Total Passing Percent
12.5 mm (½ inch)	90-100
4.75 mm (No. 4)	40-70
300 µm (No. 50)	3-20
75 µm (No. 200)	0-7
Bitumen	4.5-9.0

The plant shall produce a uniform, thoroughly coated mixture. It shall heat the aggregate, produce a surface dry condition and maintain an aggregate temperature consistent with the grade of bituminous material used. If separate coarse and fine aggregates are to be combined the plant shall be equipped with a calibrated feeder to feed the aggregates separately in the proper proportions. If a single aggregate is used, the plant shall have a screen and bins to separate the dry aggregate into two sizes; one bin shall contain aggregate of which 90 percent will pass a 4.75 mm (No. 4) sieve, the other shall contain aggregate of which 80 percent will be retained on a 4.75 mm (No. 4) sieve. The plant shall accurately proportion the aggregate and bituminous material into the mix.

When measurement and payment is on the basis of volume, the number of cubic meters (cubic yards) of premixed patching material shall be determined from weight by means of the following conversion factors: Stone or gravel.... 2370 kg/m³ (4000 pounds per cubic yard)

Slag.....2135 kg/m³ (3600 pounds per cubic yard)

702.13 Rubberized Asphalt Emulsion. This material consists of 702.04 Asphalt Emulsion SS-1 or SS-1h, blended with 702.14 Rubber Compound to produce a residual mixture of asphalt and rubber solids having a composition of 95 +/- 0.3 percent asphalt and 5 +/- 0.3 percent rubber solids by weight.

The Contractor shall furnish a certification to the Laboratory showing the following:

1. The weight of 702.14 Rubber Compound blended with the Emulsion.
2. The weight of SS-1 or SS-1h Emulsion blended with the Rubber Compound.
3. The Laboratory Report Number and/or the approved Notice of Shipment Number of the SS-1 or SS-1h Emulsion.
4. The certified lot or batch number of the Rubber Compound.
5. The percent of asphalt in the emulsion residue by distillation.
6. The percent of rubber solids in rubber compound.
7. The percent of rubber solids in the mixture of asphalt residue by distillation and rubber solids.

The weight of the 702.14 Rubber Compound to be added to a designated weight of SS-1 or SS-1h Emulsion to provide the percent of rubber solids in the mixture of asphalt residue by distillation and rubber solids specified herein shall be determined by the use of the following formula:

$$X = \frac{0.0526 (B) (W)}{(A)}$$

Where X = kilograms (pounds) of 702.14 Rubber Compound

A = percent of rubber solids in the 702.14 Rubber Compound

B = percent of asphalt residue by distillation of SS-1 or SS-1h Emulsion

W = kilograms (pounds) of SS-1 or SS-1h Emulsion

702.14 Rubber Compound. These specifications cover a dispersible rubber compound for use in rubberized sand-asphalt.

The rubber compound shall be an unvulcanized virgin synthetic rubber in the liquid latex form. The manufacturer of the rubber compound shall furnish a written certification of the total rubber solids content of the rubber compound and also provide written certification containing actual test results showing compliance with the requirements of these specifications.

The rubber compound, when tested in accordance with Supplement 1012 shall conform to the following:

Rubber compound:

Total rubber solids, percent by wt. (Certification)	49+
Ash, percent of total rubber solids (ASTM D-297)	3.5-

Combination of rubber compound with reference asphalt, mixed in accordance with Supplement 1012.02:

Flow, cm	5-
Softening point, °C raise from reference asphalt, ASTM D-36	12+
Penetration @ 25 °C., 100 g, 5 sec., mm/10 drop from reference asphalt, ASTM D-5	10+
Viscosity, Brookfield units, Model RVF, spindle No. 7 @ 10 RPM @ 94°C *	175,000+
Toughness Nm (inch pounds)	17+ (150+)
Tenacity, Nm (inch pounds)	10+ (90+)
Peak load, N (pounds)	289+ (65+)
Elongation, mm (inches)	500+ (20+)
Ductility @ 4°C, 1 cm/min., ASTM D-113	150+

* Reading taken 60 seconds after spindle is actuated.

Mixture of the rubber compound with the reference asphalt and reference aggregate:

Dispersion of rubber, number of remaining black rubbery particles visible to the naked eye	None
Resistance to flexure fatigue, number of flexural units	1500+

Testing shall be in accordance with Supplement 1012.

703 AGGREGATE

703.01 General.

TABLE 703-1 SIZES OF COARSE AGGREGATE (AASHTO M 43) (inches)

TABLE 703-1 SIZES OF COARSE AGGREGATE (AASHTO M 43) (millimeters)

703.02 Aggregate for Portland Cement Concrete.

703.03 Fine Aggregate for Mortar or Grout.

703.04 Aggregate for:

703.05 Aggregate for:

703.06 Sand Cover, 407, 408.

703.07 Mineral Filler

703.08 Granulated Slag.

703.10 Screenings

703.11 Granular Materials for 603 Bedding and Backfill

703.12 Aggregate for:

703.13 Coarse Aggregate for 451, 452, and 453 Portland Cement Concrete Pavement

703.01 General. Soundness. When the major portion of the unsound material in a coarse aggregate acquires a mud-like condition when tested for soundness, the maximum loss shall be 5 percent for all uses.

Stockpiles. Stockpiling and loading methods shall be such as to permit ready identification of the aggregates and to minimize segregation. Sites for stockpiles shall be clean prior to storing materials. Aggregates shall not be removed from stockpiles within 0.3 m (1 foot) of the ground until final cleanup of the work and no material which has become mixed with foreign matter or other sizes or grades of aggregates shall be used.

Aggregates shall be handled in such a manner that the moisture content will be reasonably uniform for each days 'run. If necessary, in order to secure uniformity of moisture content of the aggregates, stockpiling will be required.

Open-hearth and Basic-oxygen Furnace Slags. All open-hearth and basic-oxygen furnace slags shall be furnished to a size meeting the specified grading requirements of the use item to which it will be incorporated, and stockpiled for a period of not less than 6 months prior to use. New material shall not be added to the stockpile during the 6 month aging period, or prior to or during delivery from the stockpile to the project. Any addition of new material to a stockpile will require initiation of a new aging period before any material from that stockpile may be used. Prior or during the stockpiling operation, these materials shall have water added to provide a uniform moisture content not less than their absorbed moisture and the stockpile shall be maintained in a moist condition during the required stockpiling period.

The Contractor shall furnish the Engineer with a certificate stating that the slag material stockpiling requirements have been complied with for all such material furnished to the work. This certificate shall include the estimated volume, the detailed location, and the beginning the ending dates of the aging periods, of each stockpile. The certification shall be submitted with sufficient lead time, prior to intended use, to allow for inspection, sampling, and testing.

Size. Aggregate shall conform to the size specified in the material specification, the construction item or as shown in AASHTO M 43.

Method of Test. Aggregate shall be tested by the following methods:

Amount finer than 75 μ m (No. 200) sieve	S1004*
Clay lumps	S1017*
Coal and lignite	AASHTO T113
Crushed pieces	S1021*
Deleterious materials	S1029*
Effect of organic impurities on strength of mortar	AASHTO T71
Liquid limit	AASHTO T89
Percentage of wear, Los Angeles abrasion test	AASHTO T96 or ASTM C535
Plasticity index	AASHTO T90
Sieve analysis	S1004*, S1005*
Sieve analysis of mineral filler	AASHTO T37
Sodium sulfate soundness test, 5 cycle	AASHTO T104
Specific Gravity and percent absorption for fine and coarse aggregate	S1031*
Unit weight	AASHTO T19

*Supplement on file in the Office of the Director.

TABLE 703-1 SIZES OF COARSE AGGREGATE (AASHTO M 43) (inches)		
Size number	Nominal size square openings(1)	Amounts finer than each laboratory sieve (square openings), percentage by weight

		4	3-1/2	3	2-1/2	2	1-1/2	1	3/4	1/2	3/8	No. 4	No. 8	No. 18	No. 50	No. 100
1	3-1/2 to 1-1/2.	100	90 to 100		25 to 60		0 to 15		0 to 5							
2	2-1/2 to 1-1/2			100	90 to 100	35 to 70	0 to 15		0 to 5							
24	3-1/2 to 3/4.			100	90 to 100		25 to 60		0 to 10	0 to 5						
3	2 to 1.				100	90 to 100	35 to 70	0 to 15		0 to 5						
357	2 to No. 4.				100	95 to 100		35 to 70		10 to 30		0 to 5				
4	1-1/2 to 3/4.					100	90 to 100	20 to 55	0 to 15		0 to 5					
467	1-1/2 to No. 4.					100	95 to 100		35 to 70		10 to 30	0 to 5				
5	1 to 1/2						100	90 to 100	20 to 55	0 to 10	0 to 5					
56	1 to 3/8						100	90 to 100	40 to 75	15 to 35	0 to 15	0 to 5				
57	1 to No. 4.						100	95 to 100		25 to 60		0 to 10	0 to 5			
6	3/4 to 3/8.							100	90 to 100	20 to 55	0 to 15	0 to 5				
67	3/4 to No. 4							100	90 to 100		20 to 55	0 to 10	0 to 5			
68	3/4 to No. 8							100	90 to 100		30 to 65	5 to 25	0 to 10	0 to 5		
7	1/2 to No. 4								100	90 to 100	40 to 70	0 to 15	0 to 5			
78	1/2 to No. 8.								100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5		
8	3/8 to No. 8									100	85 to 100	10 to 30	0 to 10	0 to 5		
89	3/8 to No. 16.									100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5	
9	No. 4 to No. 16										100	85 to 100	10 to 40	0 to 10	0 to 5	
10	No. 4 to 0 (2)										100	85 to 100				10 to 30

(1) In inches, except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series.

(2) Screenings.

Where standard sizes of coarse aggregate designated by two or three digit numbers are specified, the specified gradation may be obtained by combining the appropriate single digit standard size aggregates by a suitable proportioning device which has a separate compartment for each coarse aggregate combined. The blending shall be done as directed by the Laboratory.

TABLE 703-1
SIZES OF COARSE AGGREGATE
(AASHTO M 43) (millimeters)

Size number	Nominal size square openings (1)	Amounts finer than each laboratory sieve (square openings), percentage by weight														
		100	90	75	63	50	37.5	25	19	12.5	9.5	4.75	2.36	1.16	300µm	150µm
1	90 to 37.5	100	90 to 100		25 to 60		0 to 15		0 to 5							

2	63 to 37.5			100	90 to 100	35 to 70	0 to 15		0 to 5							
24	63 to 19.0			100	90 to 100		25 to 60		0 to 10	0 to 5						
3	50 to 25.0				100	90 to 100	35 to 70	0 to 15		0 to 5						
357	50 to 4.75				100	95 to 100		35 to 70		10 to 30		0 to 5				
4	37.5 to 19.0					100	90 to 100	20 to 55	0 to 15		0 to 5					
467	37.5 to 4.75					100	95 to 100		35 to 70		10 to 30	0 to 5				
5	25.0 to 12.5						100	90 to 100	55 to 10	0 to 5						
56	25.0 to 9.5						100	90 to 100	40 to 75	15 to 35	0 to 15	0 to 5				
57	25.0 to 4.75						100	95 to 100		25 to 60		0 to 10	0 to 5			
6	19.0 to 9.5							100	90 to 100	20 to 55	0 to 15	0 to 5				
67	19.0 to 4.75							100	90 to 100		20 to 55	0 to 10	0 to 5			
68	19.0 to 2.36							100	90 to 100		30 to 65	5 to 25	0 to 10	0 to 5		
7	12.5 to 2.36								100	90 to 100	40 to 70	0 to 15	0 to 5			
78	9.5 to 2.36								100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5		
8	9.5 to 1.18									100	85 to 100	10 to 30	0 to 10	0 to 5		
89	4.75 to 1.18										100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5
9	4.75 to 1.18											100	85 to 100	10 to 40	0 to 10	0 to 5
10	4.75 to 0(2)												100	85 to 100		10 to 30

(1) In millimeters, except where otherwise indicated.

(2) Screenings.

Where standard sizes of coarse aggregate designated by two or three digit numbers are specified, the specified gradation may be obtained by combining the appropriate single digit

703.02 Aggregate for Portland Cement Concrete. Fine aggregate..

1. The fine aggregate shall be natural sand or sand manufactured from stone. Natural sand is required in 255, 451, 452, 453, 611, and 511 deck slabs.

2. Sieve analysis.

Sieve Size	Total Percent Passing
9.5 mm (3/8 inch)	100
4.75 mm (No. 4)	95-100
2.36 mm (No. 8)	70-100
1.18 mm (No. 16)	38-80
600 µm (No. 30)	18-60
300 µm (No. 50)	5-30
150 µm (No. 100)	1-10
75 µm (No. 200)	0-5

Should the fineness modulus of a job control sample of sand from any source vary by more than 0.20 from that of the representative sample from that source, the sand may be rejected.

3. Soundness, sulfur, etc.

	Maximum Percent
Loss, sodium sulfate soundness test, Sec. 305	12
Secs. 451, 452, 511, 515, 519, 603, 604, 608, 609, 611, 612, 622, 704 and 706	10

Where the sand has more than 0.3 percent by weight of sulfur compounds, the service record of the sand when exposed to weathering in concrete will be examined before classifying the material as satisfactory or unsatisfactory for use.

When tested for the effect of organic impurities on strength of mortar, the compressive strength at 3 and 7 days of mortar made with untreated sand shall be not less than 95 percent of the compressive strength of mortar made with treated sand.

Aggregations of soil, silt etc., maximum percent, by weight, 0.5.

Fine aggregate for 451, 452, and 453 shall contain not less than 25 percent of siliceous particles as determined by the insoluble residue test on file at the Laboratory.

Coarse Aggregate. 1. The coarse aggregate shall be washed gravel, crushed carbonate stone, or crushed air-cooled blastfurnace slag.

2. Physical properties.

Percent of wear, Los Angeles test, maximum (stone or gravel)	40
Unit weight, compacted, minimum kg/m ³ (lbs/cu.ft.) (slag)	32 (70)
Loss, sodium sulfate soundness test, percent, maximum:	
305	15
451, 452, 511, 519, 603, 622, 704 & 706	12
515	10

Deleterious substances shall not exceed the following:

	Percent by Weight	
	Superstructure	All Other Concrete
Soft pieces	2.0	3.0
Coal and lignite	0.25	1.0
Clay lumps	0.25	0.25
Pieces having a length greater than 5 times the average thickness	15	15
Shale and shaly material	0.5	1.0
Other deleterious substances, such as limonitic concretions, alkali, metallic particles and chert which disintegrates in 5 cycles of the soundness test	0.5	1.0

3. Amount finer than 75 μ m (No. 200) sieve. The percentage of material finer than the 75 μ m (No. 200) sieve in the aggregate portion of the concrete mix shall not exceed the following:

	Percent by Weight	
	Superstructure	All Other Concrete
Where the finer than 75 μ m (No. 200) sieve material from the coarse aggregate consists of the dust of fracture essentially free from clay and shale	3.4	3.8
Where the finer than 75 μ m (No. 200) sieve material from the coarse aggregate may consist of or include material other than dust of fracture.	2.0	2.2

703.03 Fine Aggregate for Mortar or Grout.

1. The fine aggregate shall be natural sand or sand manufactured from stone or air-cooled blast-furnace slag.

2. Sieve analysis.

Sieve Size	Total Percent Passing
4.75 mm (No. 4)	100
2.36 mm (No. 8)	95-100
300 μ m (No. 50)	10-40
150 μ m (No. 100)	0-10
75 μ m (No. 200)	0-5

3. Soundness, sulfur, etc.

Loss, sodium sulfate soundness test, percent, maximum.....10

When the sand has more than 0.3 percent by weight of sulfur compounds, the service record of the sand when exposed to weathering in mortar or grout will be examined before classifying the material as satisfactory or unsatisfactory for use. When tested for the effect of organic impurities on strength of mortar, the compressive strength of mortar made with untreated sand shall be not less than 95 percent of the compressive strength of mortar made with treated sand. Aggregations of soil, silt, etc., maximum percent, by weight, 0.5.

703.04 Aggregate for:

(1) Bituminous aggregate base, 301, 302

(2) Aggregate base 304

(3) Slope and channel protection, 601

1. The coarse aggregate for bituminous aggregate base used in combination with rigid pavement shall be of crushed carbonate stone, crushed gravel or crushed air-cooled blast furnace slag. The coarse aggregate for bituminous aggregate base used in flexible pavements shall be of crushed carbonate stone, crushed gavel or crushed air-cooled slag. The fine aggregate for bituminous aggregate base shall be natural sand or sand manufactured from stone, gravel or air-cooled slag.

2.

Physical properties	301	304	601
Percentage of wear, Los Angeles test, maximum (stone or gravel)	50	50	50
Unit weight, compacted, kg/m ³ (pounds per cu. ft.) minimum (slag)	29 (65)	---	29 (65)
Loss, sodium sulfate soundness test, percent maximum	15	15	15
Percentage of fractured pieces, minimum	40	90	90

Deleterious substances shall not exceed the following:

Percent by Weight		
	301	304
Soft pieces	3.0	---
Coal and lignite	1.0	---
Clay lumps	0.25	---
Pieces having a length greater than 5 times the average thickness	15	---
Shale, shaly material, and chert which disintegrates in 5 cycles of the soundness test	2.5	5

Gravel used under 304 shall be crushed from material retained on the 12.5 mm (1/2 inch) sieve.

Under 304, the portion of aggregate passing the 425 μ m (No. 40) sieve shall have a maximum liquid limit of 25 percent and a maximum plasticity index of 6.

703.05 Aggregate for:

(1) Asphalt concrete, 402, 403, 404 and 412

(2) Bituminous cold mix, 405

(3) Prime coat, 408

(4) Seal coat, 409

Fine Aggregate. 1. The fine aggregate shall be natural sand or sand manufactured from stone, gravel or air-cooled slag.

2. Sieve analysis	Total Percent Passing
Sieve size	
9.5 mm (3/8 inch)	100
4.75 mm (No. 4)	90-100
2.36 mm (No. 8)	65-100
1.18 mm (No. 16)	40-85
600 μ m (No. 30)	20-60
300 μ m (No. 50)	7-40
150 μ m (No. 100)	0-20
75 μ m (No. 200)	0-10

3. Soundness, etc.

Loss, sodium, sulfate soundness test, percent maximum	15
Aggregate of soil, silt, etc., maximum percent by weight	0.5

Coarse Aggregate. 1. The coarse aggregate shall be crushed carbonate stone, crushed air-cooled slag or washed crushed gravel.

2. Physical Properties.

Percentage of wear, Los Angeles test maximum (stone or gravel)	40
Unit weight, compacted, minimum kg/m ³ (lbs. per cu. ft.)(slag)	32 (70)
402, 403, 404, 405, 407, 408, 409 and 412.	

Loss, sodium sulfate soundness test, percent. maximum: 402, 403, 404 and 412	12
405 and 409	15
Percent by weight of fractured pieces, minimum	40

Deleterious substances shall not exceed the following:

	Percent by Weight
Soft pieces	3.0
Coal and lignite	1.0
Clay lumps	0.25
Amount finer than 75 μ m (No. 200) sieve	3.0
Pieces having a length greater than 5 times the average thickness	15
Shale, shaly material and other deleterious substances, such as limonite concretions, alkali, and chert which disintegrates in 5 cycles of the soundness test	2.5

Other requirements for coarse and fine aggregate.

1. No open hearth, basic oxygen, or electric furnace slag (steel slag) is permitted for coarse or fine aggregate (virgin or recycled) used in any surface course mix (such as 404, 448 Type 1 or Type 2 surface course, 446 Type 1 or Type 2 surface course, etc.).
2. Each individual sieve fraction soundness loss will be calculated and no fractional size shall exceed the following :
 - a. 13.0 percent for all surface courses and any asphalt concrete course directly below an open graded friction course.
 - b. 13.0 percent for No. 8 aggregate fractions used in intermediate courses that will be exposed to traffic over the winter months.
 - c. 15.0 percent for all other coarse aggregate used in intermediate courses that will be exposed to traffic over the winter months.

Statistical evaluation of data will be per Group List procedures.

703.06 Sand Cover, 407, 408. 1. The sand shall be natural sand or sand manufactured from stone or air-cooled slag.

2. Sieve analysis.

Sieve Size	Total Percent Passing
4.75 mm (No. 4)	90-100
300 μ m (No. 50)	7-40
75 μ m (No. 200)	0-10

Other requirements for coarse and fine aggregate. 1. No open hearth, basic oxygen, or electric furnace slag (steel slag) is permitted for coarse or fine aggregate (virgin or recycled) used in any surface course mix (such as 404, 448 Type 1 or Type 2 surface course, 446 Type 1 or Type 2 surface course, etc.).

2. Each individual sieve fraction soundness loss will be calculated and no fractional size shall exceed the following :
 - a. 13.0 percent for all surface courses and any asphalt concrete course directly below an open graded friction course.
 - b. 13.0 percent for No. 8 aggregate fractions used in intermediate courses that will be exposed to traffic over the winter months.
 - c. 15.0 percent for all other coarse aggregate used in intermediate courses that will be exposed to traffic over the winter months.

Statistical evaluation of data will be per Group List procedures.

703.07 Mineral Filler. 1. The mineral filler shall be limestone dust, portland cement, or other inert mineral matter. It shall be thoroughly dry and free from lumps.

2. Sieve analysis.

Sieve Size	Total Percent Passing
600 μ m (No. 30)	100
300 μ m (No. 50)	95-100
75 μ m (No. 200)	65-100

703.08 Granulated Slag. 1. The granulated slag shall be the glassy, granular materials formed when molten blast-furnace slag or electric-furnace slag is rapidly chilled, as by immersion in water. Material containing mill waste, cinders, large pieces of ungranulated slag, or other matter foreign to the production of slag in the normal operation of the blast furnace or electric furnace may be rejected.

The material shall be of such nature that it will compact to the satisfaction of the Engineer.

2. Sieve analysis.

Sieve Size	Total Percent Passing
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50 mm (2 inch)	100
25 mm (1 inch)	85-100
150 μ m (No. 100)	0-15

703.10 Screenings. 1. The screenings shall be No. 10 size gravel, stone, or air-cooled slag. Where crushed material is specified, it shall be crushed from material larger than the 12.5 mm (1/2-inch) sieve.

2. Loss, sodium sulfate soundness, percent, maximum	15
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703.11 Granular Materials for 603 Bedding and Backfill. Granular material for bedding and backfill shall be limestone, gravel, natural sand, sand manufactured from stone, foundry sand, air-cooled blast furnace slag, granulated slag, open hearth slag from approved sources on file at the laboratory or recycled portland cement concrete (RPCC).

Recycled portland cement concrete may be used without wear testing or sodium soundness testing count requirements if the Contractor provides information proving the material met this specification at the time of its original incorporation. Recycled portland cement concrete shall not be permitted in conjunction with aluminum pipe or aluminum coated steel pipe. Recycled portland cement concrete shall not contain more than two percent steel.

Granular material Type 1 shall meet the gradation of 304, and granular material Type 3 shall meet the gradations of No. 57 or 67.

Reclaimed asphalt concrete pavement or reclaimed bituminous aggregate base shall not be allowed for any bedding or backfill materials.

Foundry sand may be used if the material meets these requirements and meets the requirements of the Division of Surface Water Policy 400.007 "Beneficial use of Non-Toxic Bottom Ash, Fly Ash and Spent Foundry Sand and Other Exempt Waste," and all other regulations. Ten days prior to using foundry sand on the project, the Contractor shall submit written permission from the OEPA to the Engineer.

Granular slag shall only be used for Type 1 and Type 2 material, and shall conform to 703.08.

1. Granular Material Type 1 and 3.

Physical properties:

Percent of wear, Los Angeles test, maximum (stone or gravel)	50
Loss, sodium, sulfate soundness test, percent maximum	15
Percentage of fractured pieces, minimum, Type 3 only	90

The maximum percent by weight allowed as shale, shaly material, and chert shall be 5 percent of the material that disintegrates in 5 cycles of the soundness test.

The portion of the material passing the 425 μ m (No.40) sieve shall have a maximum liquid limit of 25 and a maximum plastic index of 6.

Gravel for Type 3 shall be crushed from material retained on the 12.5 mm (1/2 inch) sieve.

2. Granular Material Type 2. Granular material Type 2 shall meet the gradations of 703.05, 703.02 or the gradation below:

Sieve Size	Total Percent Passing
19.0 mm (3/4 inch)	100
9.5 mm (3/8 inch)	80-100
4.75 mm (No. 4)	60-100
2.36 mm (No. 8)	45-95
300 μ m (No. 50)	7-45
75 μ m (No. 200)	0-13

Physical Properties:

Loss, sodium sulfate soundness test, percent maximum	15
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The portion of the material passing the 425 μ m (No.40) sieve shall have a maximum liquid limit of 25 and a maximum plastic index of 6.

703.12 Aggregate for:

- (1) Cement treated free draining base, 306
- (2) Non-stabilized drainage base, 307

Physical properties:

Percent of wear, Los Angeles test, maximum (stone or gravel)	40
Loss, sodium sulfate soundness test, percent maximum	15
Percentage of fractured pieces*, minimum	90

*If gravel is used, the aggregate retained on the 2.37 mm (Number 8) sieve shall have at least two mechanically fractured faces. Gravel shall be crushed from material

retained on the 12.5 mm (½ inch) sieve.

The maximum percent by weight allowed as shale, shaly material, and chert shall be 5 percent of the material that disintegrates in 5 cycles of the soundness test.

The portion of the material passing the 425 µm (No.40) sieve shall have a maximum liquid limit of 25 and a maximum plastic index of 6.

Open hearth slag shall meet the requirements of 703.01.

703.13 Coarse Aggregate for 451, 452, and 453 Portland Cement Concrete Pavement.

In addition to 703.02, the following aggregate requirements shall apply for 451, 452, and 453. If the total combined quantity of 451, 452, and 453 is greater than 8000 m² (10,000 square yards), the coarse aggregate shall be Size No. 57 or 67, unless otherwise approved by the Laboratory. If the total combined quantity of 451, 452, and 453 is less than or equal to 8000 m² (10,000 square yards), the coarse aggregate shall be one of the following sizes: No. 7, No. 78, or No. 8. If Size No. 7, No. 78, No. 8 or any size of slag is selected, the coarse aggregate shall be tested in accordance with 703.02. If gravel or limestone Size No. 57 or 67 is selected, the coarse aggregate incorporated into the concrete shall meet 703.02 and be tested in accordance with ASTM C 666, Procedure B. The area generated under the curve obtained by plotting the expansions of the test specimens versus the number of test cycles shall not exceed 2.05 at 350 or less cycles.

712 MISCELLANEOUS

712.01 Expansion Shield Anchors.

712.02 Calcium Chloride.

712.03 Sodium Chloride

712.04 Lime.

712.06 Preservative Treatment for Structural Timber, Lumber, Piling, Posts, Braces and Blocks

712.09 Geotextile Fabrics

712.10 Prefabricated Edge Drain

712.01 Expansion Shield Anchors. Type A: Federal Specification FF-S-325, Group II, Type 4 Class 1, and Group VIII, Type 1.

Type B: Federal Specification FF-S-325, Group III, Type 1 (a) or (c).

Anchors shall meet the dimension requirements of the project plans.

The supplier and/or producer of the anchors shall provide a certification showing certified test results of the proof load required in Federal Specification FF-S-325.

712.02 Calcium Chloride. ASTM D 98.

712.03 Sodium Chloride. ASTM D 632 Type I, Grade 1, with the following exception:

Chemical Composition 4. Total Chlorides (NaCl, CaCl₂, and MgCl₂ as NaCl based on dry weight) not less than 97 percent.

712.04 Lime.

(a) Lime for masonry purposes shall conform to ASTM C 207 Type S. Soundness Section 5 of ASTM C 110 shall replace Section 3. Section 6 shall not apply.

(b) Lime for soil and soil aggregate stabilization shall conform to ASTM C 977 except that a minimum of 85 percent shall pass a 75 µm (No. 200) sieve when tested by wet sieving as per ASTM C 110.

712.06 Preservative Treatment for Structural Timber, Lumber, Piling, Posts, Braces and Blocks. All structural timber, lumber and piling shall conform to 711.26, and all posts, braces and blocks shall conform to 710.14, except that moisture may be removed from the untreated lumber at the time of preservative treatment. Structural timber, lumber, piling, posts and braces shall conform to the current AWWA standards and the requirements of this specification. However, the minimum retention for blocks shall be 6.4 kg/m³ (0.40 lbs. per cu. ft.).

Material treated within the State of Ohio shall either be inspected by an authorized inspector of the Department or, where such inspection is waived, the company treating the material shall submit for each charge: (1) charts from automatic recording instruments showing conditions within the treating cylinder at all times during treatment; (2) computations showing the volume of wood in the charge, the volume of preservative material used and the final net retention of each charge; and (3) approximately one dozen representative cores taken from the material with an increment borer. The Department shall be notified at least 72 hours (exclusive of Saturdays, Sunday and holidays) in advance of the treating of the material.

Material treated outside the State of Ohio shall bear the identification mark of the inspection agency and a certificate of inspection for treatment shall be forwarded to the Department. An agency qualified and approved by the Department for such inspection shall make the required inspection and the cost of this inspection and furnishing the reports shall be included in the price bid for material. The supplier shall furnish a Notarized Certificate of Conformance with each shipment of material stating the size, species, quantity shipped, project number, source of material, where treated, type of treatment, date treated, retention in kg/m³ (lbs. per cu. ft.), charge number, inspection agency, inspection report number and date issued.

When guardrail offset blocks are furnished by an Ohio supplier, a Notarized Certificate of Conformance shall be furnished by the supplier with each shipment of material stating the size, species, quantity shipped, project number, vendor's order number, type of treatment and retention in kg/m³ (lbs. per cu. ft.).

Materials. Timber preservatives shall conform to AASHTO M 133 and shall include creosote oil, creosote coat-tar solution, ammoniacal copper arsenate (ACA), chromated copper arsenate (CCA), Types A, B or C, and pentachlorophenol.

Preparation for Treatment. Sorting. Whenever it is practicable the material shall be sorted into one kind or designated group of kinds of wood and into pieces of approximately equal size and moisture and sapwood content, and so separated as to insure contact of treating medium with all surfaces.

Framing. So far as practicable, all adzing, boring, chamfering, framing, graining, mortising, surfacing, etc., shall be done prior to treatment.

Incising. All Douglas fir, except rails and rail posts, the least dimension of which is 50 mm (2 inches) or over shall be incised by a suitable power-driven machine before treatment. Lumber having a thickness of 75 mm (3 inches) and over, shall be incised on all four sides. Lumber less than 75 mm (3 inches) thick shall be incised on the wide faces

only, except where indicated on the plans. The spacing and shape of the cutting teeth and the method of incising shall be such as to produce a uniform penetration. The depth of the incisions shall be not less than the following:

Size	Minimum depth of incision, mm (in.)
50 x 300 (2 x 12)	9 (3/8)
75 x 300 (3 x 12)	11 (7/16)
100 x 300 (4 x 12)	13 (1/2)
200 x 250 (8 x 10)	14 (9/16)
250 x 300 (10 x 12)	16 (5/8)
300 x 300 (12 x 12)	19 (3/4)
Intermediate Sizes in proportion.	

Amount of Preservative. The net retention in any charge shall be not less than 90 percent of the quantity of preservative specified; but the average retention by the material treated under any contract or order and the average retention of any five consecutive charges shall be at least 100 percent of the quantity specified. The minimum amounts of preservative retained shall be as specified by AASHTO M 133 which are those set forth in the referenced American Wood-Preservers' Association Standard. All species of structural timber, lumber, piling, posts and blocks shall be treated according to the current AWWA standard specifications.

712.09 Geotextile Fabrics. The fabric shall be composed of strong rot-proof polymeric fibers formed into a woven or non-woven fabric which meets the following requirements:

Type A: Underdrains and Slope Drains.	
Minimum Tensile Strength ¹	355 N (80 lbs.)
Minimum Puncture Strength ²	110 N (25 lbs.)
Minimum Tear Strength ³	110 N (25 lbs.)
Minimum Burst Strength ⁴	900 kPa (130 psi)
Apparent Opening Size ⁵	
Soil Type-1: Soils with 50% or less passing 75 µm (No. 200) sieve .	AOS 0.6mm
Soil Type-2: Soils with 50%-85% passing 75 µm (No. 200) sieve	AOS 0.3mm.
Minimum permeability ⁶	1X10 ⁻² cm/sec.
Type B: Filter Blankets for Rock Channel Protection.	
Minimum Tensile Strength ¹	890 N (200 lbs.)
Minimum Puncture Strength ²	355 N (80 lbs.)
Minimum Tear Strength ³	220 N (50 lbs.)
Minimum Burst Strength ⁴	2200 kPa (320 psi)
Minimum Elongation ¹	15%
Apparent Opening Size ⁵	AOS 0.6mm.
Minimum Permeability ⁶	1X10 ⁻³ cm/sec.
Type C: Sediment Fences.	
Minimum Tensile Strength ¹	535 N (120 lbs.)
Maximum Elongation at 265 N (60 lbs.) ¹	50%
Minimum Puncture Strength ²	220 N (50 lbs.)
Minimum Tear Strength ³	180 N (40 lbs.)
Minimum Burst Strength ⁴	380 kPa (200 psi)

Apparent Opening Size ⁵	AOS 0.84mm.
Minimum Permittivity ⁶	1X10 ⁻² sec.-1
Ultraviolet Exposure Strength Retention ⁷	70%
Type D: SubgradeSubbase Separation or Stabilization	
Minimum Tensile Strength ¹	800 N (180 lbs.)
Maximum Elongation at 755 N (170 lbs.) ¹	35%
Minimum Tear Strength ³	310 N (70 lbs.)
Minimum Burst Strength ⁴	2590 kPa (375 psi)
Minimum Puncture Strength ²	310 N (70 lbs.)
Apparent Opening Size ⁵	Same as Type A
Permeability ⁶	1X10 ⁻³ cm/sec.
¹ ASTM D 4632 ² ASTM D 4833. ³ ASTM D 4533. ⁴ ASTM D 3786; 125 x 125 mm (5 inch x 5 inch) or 125 mm (5 inch) diameter minimum size sample; 75 mm (3 inch) diameter clamping surface opening; 1.80 mm ± 0.05 mm (0.070 inch ± 0.002 inch) diaphragm thickness 170 (± 15) mL. per minute fluid displacement. ⁵ ASTM D 4751. ⁶ ASTM D 4491. ⁷ ASTM D 4355.	

All minimum strengths shown are average roll minimum values in the weakest principal direction.

The fabric shall be free of any treatment which might significantly alter its physical properties. During the shipment and storage, the fabric shall be wrapped in a heavy-duty protective covering to protect it from direct sunlight, dirt, dust and other debris.

For fabric Types A, B and C, the manufacturer shall submit a certification with each shipment of material stating that it meets specification requirements. For Type D material, the manufacturer shall submit certified test data to cover each shipment of material.

712.10 Prefabricated Edge Drain. Prefabricated edge drain shall consist of a polymeric core with a minimum thickness of one inch wrapped in fabric meeting 712.09 Type A. The drain shall be flexible, rectangular in shape, and of hollow construction. The core material shall be resistant to petroleum-based chemicals, naturally occurring soil chemicals, and road de-icing agents. The core material shall have sufficient flexibility to withstand bending and handling during installation without damage. The core shall provide a minimum of 0.064m² (100 square inches) unobstructed (one side only) drainage area per 0.3 m (one foot) of width. Side walls of the core shall provide at least 5 percent open area to permit unobstructed flow through the filter and wall to the core. The prefabricated edge drain shall have a minimum compressive strength of 290 kPa (6000 pounds per square foot) with a maximum 20 percent compression in a parallel plate compression test (ASTM D 695). The minimum (single side) core flow capacity shall be 10 gallons per minute per foot of width for a 0.1 gradient at 10 pounds per square inch bladder load per ASTM D 4716. The manufacturer's certified test results shall be furnished in accordance with 101.061.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 877
TEMPORARY SEDIMENT AND EROSION CONTROL**

April 13, 1999

- 877.01 Description**
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- 877.06 Method of Measurement**
- 877.07 Basis of Payment**

877.01 Description. This work shall consist of temporary control measures as detailed in the plans and/or general notes during the life of the contract to control sediment and erosion through the use of straw or hay bales, dikes, slope protection, sediment pits, basins and dams, slope drains, coarse aggregate, mulches, grasses, filter fabrics, ditch lining, inlet protection and other erosion control devices or methods.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary controls are required for construction work outside the right-of-way in areas such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sites. This work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

877.02 Materials. Commercial fertilizer shall be (10-20-10) and shall conform to Item 659.

Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching materials shall be applied in accordance with Item 659.

Temporary filter fabric ditch checks shall consist of 30 inch [0.8m] wide filter fabric with sound wood supports with maximum spacing of 10 feet [3.0m] on centers. Temporary inlet filter barriers shall consist of 18 inch [0.5m] wide filter fabric fence with a securely nailed 2 x 4 wood frame.

Temporary bale filter dikes and perimeter filter fabric fence shall consist of straw or hay bales, or 30 inch [0.8m] wide filter fabric fence with sound wood supports with a maximum spacing of 10 feet [3.0m] on centers. All the above filter fabric fence shall meet the requirements of 712.09, Type C.

Temporary dikes shall consist of suitable 203 material.

Temporary slope drains shall consist of pipe, pipe caps, coarse aggregate, riprap, rock channel protection, or other materials. Sediment pits are not paid for separately but are included as part of slope drain construction.

Pipe caps shall be included in the unit bid price for the pipe. Pipe caps shall have a minimum diameter of 1/4 inch (6.4mm) holes and be specifically designed to connect to the pipe. There will be a minimum of one hole per square inch (645 mm²) of the cross sectional end area of the pipe cap.

Temporary sediment basins and dams shall be constructed by methods described in Item 203 Excavation and Embankment and Item 601 Rock Channel Protection, Type C or D with filter.

Temporary rock check dams shall be constructed of Item 601 Rock Channel Protection, Type C or D without filter.

Temporary ditch and slope protection shall meet the requirements of Item 670.

877.03 Construction Requirements. The Storm Water Pollution Prevention Plan (SWPPP) details the placement, location and description of the temporary and permanent erosion control items. The following descriptions shall be used to supplement the plan. The Contractor shall rearrange and modify the plan quantities to meet the field conditions and the National Pollutant Discharge Elimination System (NPDES) Permit.

When the plan does not have a SWPPP, the Contractor shall submit a plan detailing control feature locations and quantities at the pre-construction meeting.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

(A) Clearing and Grubbing. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, and borrow and fill operations as determined by the project conditions. The Contractor shall preserve existing vegetation where attainable and temporarily seed and mulch disturbed idle areas as stated.

Inactive cleared and grubbed areas that are scheduled to remain idle for more than 45 days shall be stabilized with vegetation (i.e. temporary seed and mulch) within 7 days following the clearing and grubbing operations. If an area is within 50 feet [15 m] of any water body (i.e. stream, river, pond, etc.), then it shall be vegetated within 2 days following the clearing and grubbing operations.

(B) Installation of Control Features. Temporary erosion and sediment control items shall be installed as detailed and are to remain functional until the upper slope drainage areas are fully stabilized.

Temporary perimeter, ditch check or inlet filter fabric fence shall be constructed in accordance with Standard Drawing DM-4.4.

1. Temporary Perimeter Controls: Temporary perimeter filter fabric fence shall protect the following from sheet flow runoff: off right of way locations; off construction limit locations; around water bodies, wet lands or around other significant items designated on the plan.

Dikes shall be used to prevent flow from coming on to the project and to barren areas on the project.

The Contractor shall install perimeter filter fabric fence and dikes concurrent with the clearing and grubbing operations.

2. Inlet Protection: The Contractor shall use an 18 inch [0.5m] wide filter fabric fence supported around a storm drain inlet or manhole with securely nailed 2 x 4 inch (50 X 100 mm) lumber. The Contractor shall excavate a six inch (150 mm) trench around the inlet, and drive the posts six inches (150 mm) below the excavated trench bottom. The fabric shall be stretched around the frame, placing six inches of fabric in the trench and secure tightly. The fabric shall overlap on one side of the inlet so that the fabric ends are not attached to the same post. Backfill the excavated soil onto the fabric and compact tightly.

The Contractor shall construct the inlet protection as soon as the inlet is completed.

3. Temporary and Permanent Seeding: Use seed and mulch liberally during and after construction and before or during winter shut down. Temporary seeding areas shall be fertilized at one-half the specified rate of application in Item 659. Temporary seeding shall be annual ryegrass sown at 2 pounds per 1000 square feet [1 kg/100 m²] and mulched in accordance with Item 659. When project conditions prevent the incorporation of fertilizer into the soil and preparation of the seed bed cannot be performed in accordance with Item 659, these requirements may be waived. Temporary seed shall not be placed on frozen ground.

The Contractor shall place the permanent seed on all barren areas within 7 days of

obtaining final grade. The Contractor shall place the temporary seed and mulch as stated under clearing and grubbing.

4. Slopes: Dikes, slope drains and ditches shall be installed to divert water from bare soil and to protect cut and fill slopes. The Contractor shall place dikes at the top of fill slopes to protect the sides slopes from erosion.

The Contractor shall install dikes and slope drains when no filling activity occurs for three or more weeks and when slope height is greater than 8 feet [2.5m].

The Contractor shall construct a ditch at the top of cut slopes prior to the cutting of the slope to reduce runoff potential.

5. Ditch Checks: Filter fabric fence or rock checks are placed to protect ditches from erosion and to filter sediment from flowing water. The checks are placed across the width of the ditch.

Filter fabric fences are installed for 2 acres (8,000 m²) or less of drainage area. Rock ditch checks are installed for 2 to 5 acres (8,000 to 20,000 m²) of drainage area. When no rock quantities are denoted for rock checks, use the calculated rock quantities from basins for the rock checks.

Ditch checks shall be installed in conjunction with sediment basins and dams when the above drainage areas are not exceeded.

The Contractor shall place the ditch checks as soon as the ditch is cut.

6. Bale Filter Dikes: Bale filter dikes shall be installed a few feet (meters) from the toe of a slope to filter and/or divert sediment to an appropriate control before it enters a water body on or off the project limits.

It is used to collect sediment for a maximum of:

- a) less than 1/4 acre [1,000 m²] without an outlet
- b) slope length of less than 100 feet [30 m] at a maximum slope of 2:1.
- c) use outlet or pit every 100 feet [30 m] for a 2:1 slope. Use a greater spacing for flatter slopes.

Bale filter dikes shall be constructed in accordance with Standard Drawing DM- 4.3. When filter fabric is used for the bale filter dike, the location is accordance with Standard Drawing DM-4.3 and the construction details shown in Standard Drawing DM-4.4 are used.

The Contractor shall construct the bale filter dikes concurrent with the grubbing operations.

7. Sediment Dams or Basins: Basins and dams are placed and used at concentrated and critical flow locations to settle sediment out before leaving the project. Use basins at the bottom of a ravine, at a culvert inlet or outlet, along or at the end of the ditch and at any concentrated sediment exit point of the project. Use a basin quantity of 67 cubic yards for every acre of drainage area (125 m^3 per $10,000 \text{ m}^2$).

The Contractor shall construct sediment dams and basins at the first step of grading and within 7 days of commencing grubbing operations.

8. River, Stream and Water Body Protection: Protect all streams or water bodies passing through or on the project. Use filter fabric or bale filter dikes to line the water edges. Divert project sediment flow by using dike and slope protection. A combination of the above or other control features can be used.

The Contractor shall construct the above features concurrent with the grubbing operations.

a) Stream Relocation: Fully stabilize the new stream channel prior to diverting flow into the new channel.

b) Stream and River Crossing: Provide a means for construction equipment to cross water courses without causing erosion of streambanks or deposits in the channel. Plan and locate crossings well in advance of needing them. Disturbance to water bodies shall be kept to a minimum. Crossings shall be kept to a minimum and as narrow as practical. Crossings shall be made in shallow areas rather than deep pools where possible. Clearing, grubbing and excavation of streambanks, bed and approach sections shall be kept to a minimum.

The provisions for conveyance shall anticipate high flows and shall not impede the movement of aquatic life.

If culverts are used, the following minimums shall apply: Place culverts on the existing stream bed to avoid a drop in waterfall at the downstream end of the pipe. Culvert diameter shall be at least three times the depth of normal stream flow at the point of the crossing. The minimum size culvert to be used shall be 18 inches [0.5m]. There shall be sufficient number of culverts to completely cross the channel from stream bank to stream bank with no more than 12 inches [0.3m] between each culvert.

All fill and surface material placed in the channel, around the culverts or on the surface of the crossing shall be clean non toxic dump rock fill Type B, C, or D. Extend placed rock up slope from original stream bank to catch and remove erodible material from equipment.

Aggregate used does not need to be removed. Care should be taken to avoid any impoundment or restriction to fish passage. All pipes must be removed upon project

completion.

The stream crossing work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract bid prices for the items to which they apply.

When the normal water elevation is shown on the plan, the Contractor shall construct crossings to accommodate a water elevation at least one foot (0.3m) above the stated normal water elevation. Fording in accordance with 107.21 is not allowed.

877.04 Maintenance. Temporary erosion control features shall be properly maintained. The Contractor shall maintain these items with the concurrence of the Engineer. When the Contractor properly places the erosion control items in the contract in accordance with the contract documents, then the Department will pay for the additional cost to maintain or replace these items of work by the unit bid prices, agreed unit prices or by 109.04. Silt removed from erosion control features shall be disposed of in accordance with 203.05.

The Engineer or appointed inspector will check the temporary and permanent erosion control features every 7 days or within 24 hours of any rainfall of more than ½-inch (10 mm).

(A) Temporary Perimeter, Ditch Checks, Inlet Protection Filter Fabric Fence, Dikes and Bale Filter Dikes. Trapped sediment shall be removed and cleaned when it reaches half the height of the lowest section. The Contractor shall make the appropriate corrections when the above fail or become non functional. The Contractor shall maintain the items until the up slope permanent grass coverage is 70 percent or better. The Contractor shall remove the items when the up slope permanent grass coverage is 70 percent or better.

(B) Temporary and Permanent Seed: The seed bed shall be thoroughly watered in accordance with the requirements of Item 659. The quantity of water will be measured and paid for as Item 659 water. Seeded areas shall be maintained until 70 percent or better cover is established. Temporary seeded areas shall be mowed and paid for in accordance with Item 659.

(C) Sediment Dams and Basins: Deposited sediment shall be removed when the initial volume has been reduced one-half. The Contractor shall make the appropriate corrections when these items fail or non functional. The Contractor shall remove the dams and basins when the permanent seed and mulch is placed on the entire project.

877.05 Performance. The Contractor shall install additional erosion control features, make adjustments to meet the field conditions, anticipated future work or corrections based on the weekly storm water inspections with the concurrence of the Engineer. The

type and quantity will be paid by the unit bid prices, agreed unit prices or by 109.04.

In the event that the Contractor or its agents refuse or fail to adhere to the requirements of the 404 Permit, the 401 Water Quality Certification and/or the NPDES Storm Water Permit and as a result an assessment or fine is made or levied against the Ohio Department of Transportation, the Contractor shall reimburse the Department within ten (10) calendar days of the assessment or fine or the Department may withhold the amount of the fine from the Contractor's next pay estimate and deliver that sum to the permitting agencies issuing the assessment or fine.

These fines are not to be construed as a penalty but are liquidated damages to recover costs assessed against the Department due to the Contractor's refusal or failure to comply with the permit requirements.

If proper sediment and erosion controls are not being provided by the Contractor, progress estimates shall be withheld until proper controls are placed.

All temporary erosion control items shall be removed before the project is accepted. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with Item 203.

877.06 Method of Measurement. Temporary erosion and sediment control work, completed and accepted, will be measured as follows:

(A) All fertilized areas will be measured and paid for as Item 659 Commercial Fertilizer.

(B) Temporary seeding and mulching will be measured by the square yard (square meter) of seeded and mulched area completed in accordance with these specifications.

(C) Temporary slope drains will be measured by the linear foot (meter) complete in place.

(D) Temporary Perimeter, Inlet Protection, Ditch Check, Filter Fabric Fence will be measured per linear foot (meter) in place. Bale filter dike will be paid under temporary perimeter fabric fence.

(E) Rock required will be paid for under Item 601 Rock Channel Protection, Type C or D with or without filter.

(F) Temporary sediment dams, and basins will be measured by the cubic yard (cubic meter) of excavation and embankment complete in place.

(G) Temporary dikes will be measured by the cubic yard(cubic meter), of excavation and embankment complete in place.

(H) Temporary slope or ditch protection will be measured by the square yard (square meter), complete in place.

(I) Sediment Removal will be measured in cubic yards(cubic meters) completed in place. The sediment removed from dams, basins, inlet protection, ditch checks, perimeter filter fabric, bale filter dikes and all other types of filter fabrics, straw or hay bales or any other temporary sediment control items will be paid under this item.

In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, such temporary work shall be performed by the Contractor at his expense.

877.07 Basis of Payment: Accepted quantities of temporary sediment and erosion control work placed and measured as provided above, will be paid for under:

Item	Unit	Description
877	Square yard (square meter)	Temporary seeding and mulching
877	Linear foot (meter)	Temporary slope drains
877	Cubic yard (cubic meter)	Temporary sediment basins and dams
877	Linear foot (meter)	Temporary perimeter, ditch check or inlet protection filter fabric fence
877	Linear foot (meter)	Temporary perimeter filter fabric fence
877	Linear foot (meter)	Temporary ditch check filter fabric fence
877	Linear foot (meter)	Temporary inlet protection filter fabric fence
877	Cubic yard (cubic meter)	Temporary dikes
877	Square yard (square meter)	Temporary ditch protection
877	Square yard (square meter)	Temporary slope protection
877	Cubic yard (cubic meter)	Sediment removal

APPENDIX A

SOIL TEST RESULTS

June 2, 2000

Transportation
Infrastructure
Environmental
Planning
Architecture
Design/Build
Surveying

ENTACT
1360 North Wood Dale Road
Suite A
Wood Dale, IL 60191

VIA FACSIMILE & MAIL
(630) 616-2100

Attention: Mr. Mark Waxali

Reference: PEI Project No. 7068.E0

Dear Mr. Waxali:

Attached are the results of testing conducted on the sample delivered to our lab.

The following procedures were used for this testing:

Standard Test Method for Particle-Size Analysis of Soils (sieve only) (ASTM D 422-63)

Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D 2974-87)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D 4318-98)

Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D 1557)

Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D 2488)

Standard Test Method for Specific Gravity of Soils (ASTM D 854-98)

If you have any questions or we can be of additional assistance, please do not hesitate to call.

We will dispose of the remainder of your sample in 90 days unless notified of your desire to make other arrangements.

Thank you for letting us serve you on this project.

Very truly yours,

PATRICK ENGINEERING INC.



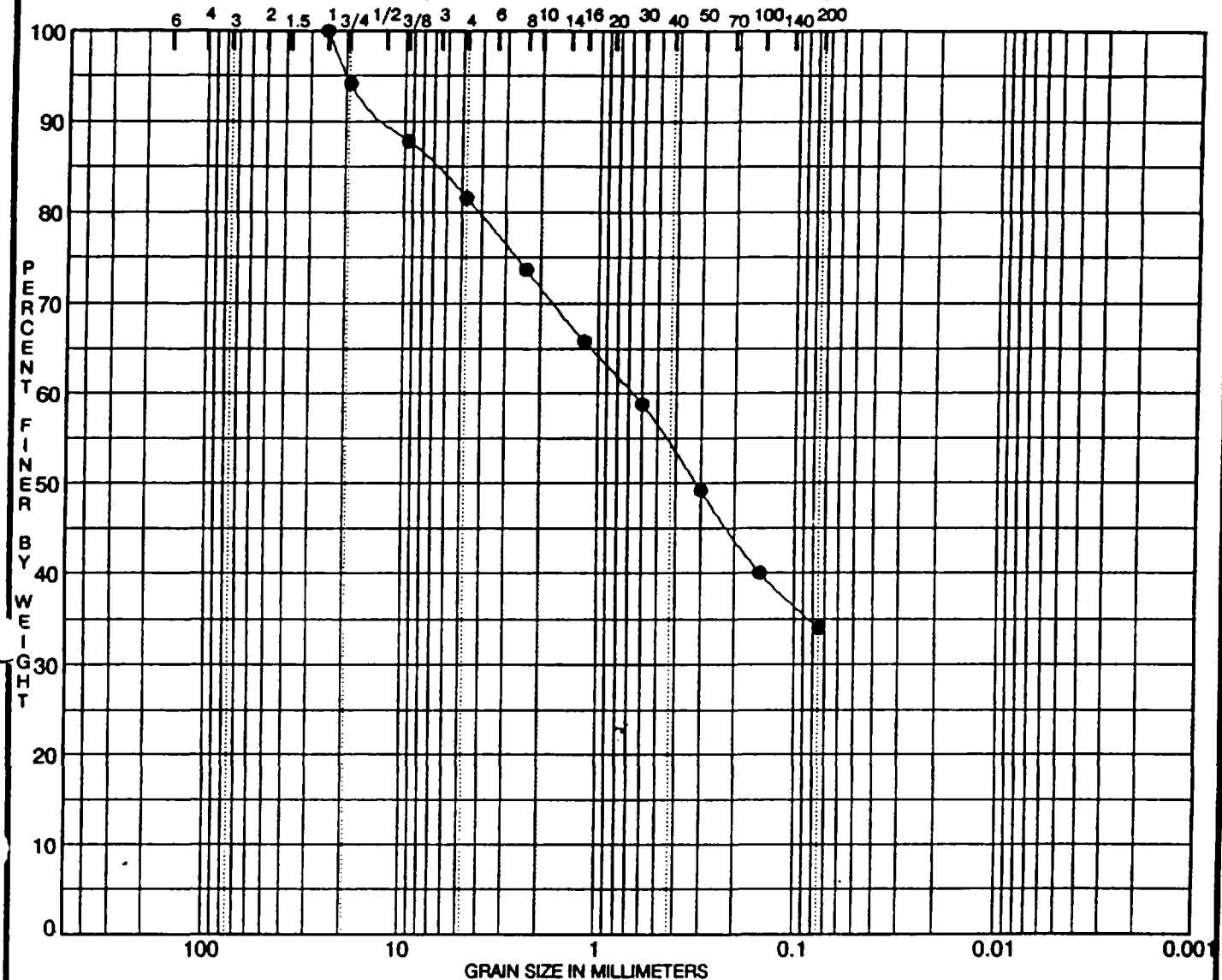
Michael J. Stewart
Lab Manager

Enclosures: Sieve Analysis
LOI Data Sheet
Atterberg Data Sheet
Modified Proctor Curve
Visual Classification
Specific Gravity Data Sheet

U.S. SIEVE OPENING IN INCHES

U.S. SIEVE NUMBERS

HYDROMETER



PATRICK

ENGINEERING INC.

Loss on Ignition, ASTM D2974

Date: 8/1/2000

Tech: DMMS

Checked By:

MS

Job N 7068.E

Boring No.	Sample No	Depth (ft)	Tare #	Tare Wt(g)	Wet Wt(g)	Dry Wt(g)	Ash Wt (g)	MC%	LOI	
1			9	46.86	177.45	162.8	154.4	12.6	7.2	
2								#####	#####	
3								#####	#####	
4								#####	#####	
5								#####	#####	
6								#####	#####	
7								#####	#####	
8								#####	#####	
9								#####	#####	
10								#####	#####	
11								#####	#####	
12								#####	#####	
13								#####	#####	
14								#####	#####	
15								#####	#####	
16								#####	#####	
17								#####	#####	
18								#####	#####	
19								#####	#####	
20								#####	#####	
21								#####	#####	
22								#####	#####	
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27								#####	#####	
28								#####	#####	
29								#####	#####	
30								#####	#####	
31								#####	#####	
32								#####	#####	
33								#####	#####	
34								#####	#####	
35								#####	#####	
36								#####	#####	
37								#####	#####	
38								#####	#####	
39								#####	#####	
40								#####	#####	

PATRICK ENGINEERING INC.

Project No.: 7068.E0

Tech: MS

Boring No.:

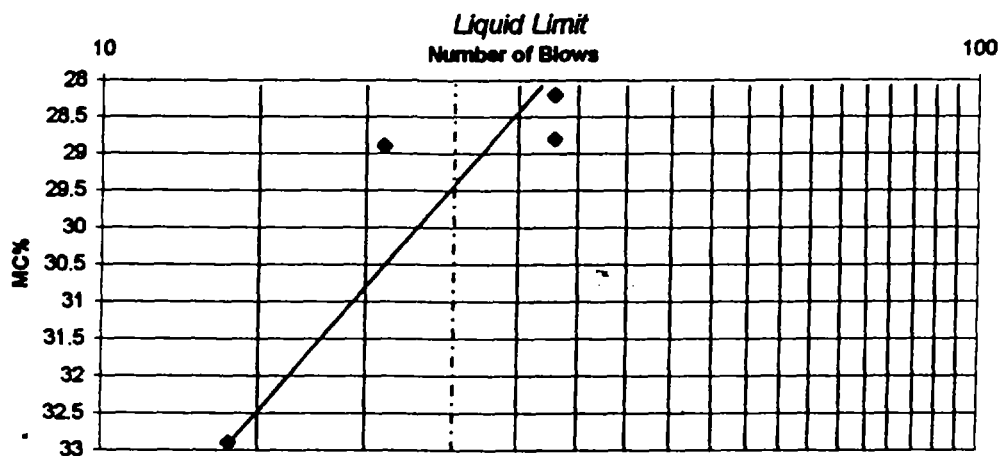
Date: 5/30/2000

Sample No.:

Sample Description: Dark Brown Silty Clay

Atterberg Limits

Number Of Blows	21	33	33	14		LL=	29
Tare Number	28	21F	16	90		PL=	21
Wt. of tare (g)	1.57	1.58	1.53	1.47		PI=	8
Wt. of wet soil&tare	24.66	20.28	13.03	14.32		USCS	CL
Wt. of dry soil&tare	19.48	16.1	10.5	11.14		CLASS	
Moisture Content %	28.9	28.8	28.2	32.9	#DIV/0!		
One Point LL	28.3	29.8	29.2	30.7	#DIV/0!		
Avg.:							



Plastic Limit

Tare Number	49	20	26				
Tare Weight (g)	1.57	1.56	1.61				
Wt. of wet soil&tare	2.72	3.54	2.99				
Wt. of dry soil&tare	2.52	3.2	2.75				
Moisture Content %	21.1	20.7	21.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Avg:							

Job No. 7088.E0 Date 6/5/00
Project ENTACT - OHIO

Source of Material 1
Description of Material Dark Brown Silty Sand, Little C to F Gravel, Trace Clay SM
Test Method ASTM D1557 Method B

TEST RESULTS

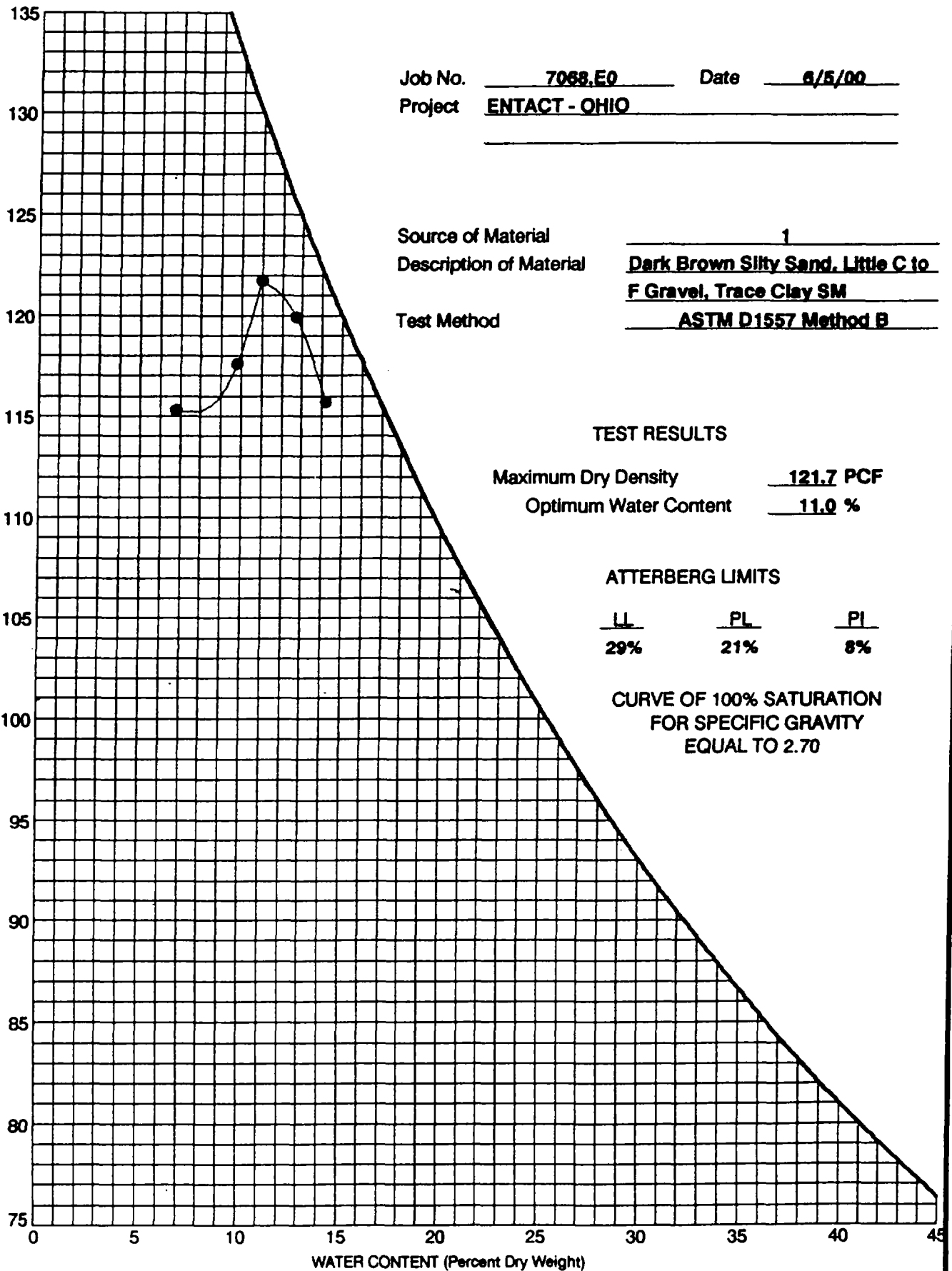
Maximum Dry Density 121.7 PCF
Optimum Water Content 11.0 %

ATTERBERG LIMITS

<u>LL</u>	<u>PL</u>	<u>PI</u>
<u>29%</u>	<u>21%</u>	<u>8%</u>

CURVE OF 100% SATURATION
FOR SPECIFIC GRAVITY
EQUAL TO 2.70

DRY DENSITY POUNDS PER CUBIC FOOT



MOISTURE-DENSITY RELATIONSHIP

Patrick Engineering Inc.
Lisle, Illinois

PROJECT NO 7068.EC

PROJECT ENTACT

CALCULATED BY MS

DATE 6/2/00

CHECKED BY _____

DATE _____

TITLE Visual Soil Classification

SHEET _____ OF _____

Dark Brown Silt, Sand, Little Coarse to Fine Gravel, Trace Clay,
Trace Organics (Wood and Rootlets), Low Plasticity Moist SM

Specific Gravity Determination

(ASTM D854)

ENTAIL.

Boring No. _____ Sample No. _____ Depth _____ Job No. 7068.E0
 Description of Sample Dark Brown Clayey Silt
 Date 5/30/00 Technician MS Checked By DM

Bowl Number: 101

Flask No.	<u>8</u>	
Wt. of flask filled with water, g (calib. check)	<u>@ °C</u>	<u>@ °C</u>
Wt. of dry sample, g (W _d)	<u>57.45</u>	
Wt. of flask + sample + water, g (W _{fsw})	<u>697.22</u>	
Temp. of water and soil, °C	<u>24.1</u>	
Wt. of flask filled with water @ test temp., g (W _{fw} from graph)	<u>661.47</u>	
Water density correction factor (K from table, ASTM D 864)	<u>0.9991</u>	
Specific Gravity @ 20° C	<u>2.65</u>	

Average G_s _____

Calculation: $G_s = (W_d \times K) \div (W_d + W_{fw} - W_{fsw})$

APPENDIX B
VOLUME CALCULATIONS

BY _____ DATE _____

CHK'D RCB DATE 8/27/01

1360 N. Wood Dale Rd. Suite A

Wood Dale, IL 60191

630.616.2100 FAX: 630.616.9203

SHEET

OF

OBJECT _____

SUBJECT _____

Estimated Volume of Material
Assume 1.0' depth
Master Mitake Cleveland

Perimeter Soils

(EECA est. 1.0 - 2.0')*

East Side

$$\begin{aligned} \text{Roundhouse (X-1 thru X-4)} &= 273' \times 51.18' \times 1.0 \\ &= 13,972 \text{ ft}^3 \\ &= \boxed{517.5 \text{ y}^3} \end{aligned}$$

$$\begin{aligned} \text{West 3rd Street (X-5 thru X-9)} &= 409.5' \times 10.25' \times 1.0 \\ &= 4197.3 \text{ ft}^3 \\ &= \boxed{155 \text{ y}^3} \end{aligned}$$

South Side

$$\begin{aligned} \text{West 3rd St. Bend (X-9 thru X-11)} &= 34.12' \times 184.27' \times 1.0 \\ &= 6287.3 \text{ ft}^3 \\ &= \boxed{232.86 \text{ y}^3} \end{aligned}$$

$$\begin{aligned} \text{(X-11 thru X-12)} &= 27.3' \times 177.45' \times 1.0 \\ &= 4844.3 \text{ ft}^3 \\ &= \boxed{179.4 \text{ y}^3} \end{aligned}$$

$$\begin{aligned} \text{(X-13)} &= 102.37' \times 81.9' \times 1.0 \\ &= 8384.1 \text{ ft}^3 \\ &= \boxed{310.5 \text{ y}^3} \end{aligned}$$

West Side

$$\begin{aligned} \text{Along B&O RR Tracks (X-14 thru X-15)} &= 580.12' \times 20.48' \times 1.0 \\ &= 11,880.8 \text{ ft}^3 \\ &= \boxed{440.0 \text{ y}^3} \end{aligned}$$

Perimeter Soils: 1835 y³Holmden Ave Soils: ~ 1000 y³

areas Requiring

Add'l Excavation → 309 y³3144 y³(AOC 9 #37 p. 19)

20 tons/truck

200-250 trucks

4000 tons per pot vjack

*

BY PAV DATE 2/2
CHK'D RED DATE 8/27/01



1360 N. Wood Dale Rd. Suite A
Wood Dale, IL 60191
630.616.2100 FAX: 630.616.9203

SHEET

1 OF 1

OBJECT

SUBJECT

ESTIMATED VOLUME OF TREATED MATERIAL

Assumes 2.0' depth

Master Metals Cleveland

Perimeter Soils:

(EECA est. depth 1.0-2.0')

East Side:

Roundhouse (X-1 thru X-4): $273' \times 51.18' \times 2.0'$

$= 27,944 \text{ ft}^3$

$= 103443$

W. 3rd St (X-5 thru X-9): $409.5' \times 10.25' \times 2.0'$

$= 8,394.75 \text{ ft}^3$

$= 310.943$

South Side

W. 3rd St (Bend) (X-9 thru X-11): $34.12' \times 184.27' \times 2.0'$

$= 12,574 \text{ ft}^3$

$= 465.743$

(X-11 thru X-12): $273' \times 177.45' \times 2.0'$

$= 9688 \text{ ft}^3$

$= 358.843$

(X-13): $102.37' \times 81.9' \times 2.0'$

$= 16,768.2 \text{ ft}^3$

$= 621.043$

West Side

Along B&O RR Tracks (X-14 thru X-19): $580.12' \times 20.48' \times 2.0'$

$= 23,761.7 \text{ ft}^3$

$= 880.063$

PERIMETER SOILS: 3670.5

HOLMSEN AVE STOCKPILES: $\frac{1000.00}{\text{SOILS}} = 3000.00$

(AOC $\frac{9}{24}$)

~~6670.5~~

4670.5

Areas Requiring
add'l Excavation

618

5288.5

BY RED DATE 8/23/01

CHK'D _____ DATE _____



ENTACT

1360 N. Wood Dale Rd. Suite A

Wood Dale, IL 60191

630.616.2100 FAX: 630.616.9203

SHEET

/ OF _____

PROJECT MASTER METALS - CLEVELANDSUBJECT VOLUME OF ONSITE SOIL TO BE EXCAVATEDGRAVEL AREA ON S.E. CORNER:

$$(50 \times 113) - (35 \times 12) - (24 \times 30) = 4510 \text{ ft}^2$$

TWO AREAS ON WEST SIDE:

$$\frac{93 + 114}{2} \times 25 = 2587.5 \text{ ft}^2$$

$$50 \times 25 = 1250 \text{ ft}^2$$

TOTAL OF THE 3 ONSITE AREAS:

$$4510 + 2587.5 + 1250 = 8347.5 \text{ ft}^2$$

VOLUME OF 2 ft OF CLEAN FILL IN THE 3 AREAS:

$$8347.5 \text{ ft}^2 \times 2 \text{ ft} \times \frac{1 \text{ yd}^3}{27 \text{ ft}^3} = 618 \text{ yd}^3 \text{ clean fill}$$

VOL. OF IMPACTED SOIL IN THE 3 AREAS:ASSUMING 1 ft depth: 309 yd³ASSUMING 2 ft depth: 618 yd³

BY Red DATE _____

CHK'D _____ DATE _____



ENTACT

1360 N. Wood Dale Rd. Suite A
Wood Dale, IL 60191
630.616.2100 FAX: 630.616.9203

SHEET

2 OF _____

PROJECT _____

SUBJECT _____

ESTIMATED VOLUME OF PITS ONSITE

$$2(10' \times 10' \times 3') = 600$$

$$25 \times 12 \times 3 = 900$$

$$30 \times 18 \times 6 = 3240$$

$$\underline{\hspace{1cm}} \\ 4740 \text{ ft}^3 = 175 \text{ yd}^3$$

BY RED DATE _____

CHK'D _____ DATE _____



ENTACT

1360 N. Wood Dale Rd. Suite A

Wood Dale, IL 60191

630.616.2100 FAX: 630.616.9203

SHEET

3 OF _____

PROJECT _____

SUBJECT _____

APPROX. FOOTPRINT FOR PLACEMENT OF
IMPACTED SOIL:

$$\begin{array}{r} 46000 \\ 450 \\ 4500 \\ 9350 \\ 8800 \\ \hline 69100 \text{ ft}^2 \end{array}$$

APPROX AREA FOR ASPHALT & GEOTEXTILE:

$$\begin{array}{r} 55000 \\ 1250 \\ 5500 \\ 8330 \\ 11400 \\ \hline 81700 \text{ ft}^2 \end{array}$$

ESTIMATED DEPTH OF FILL:

IF ONE FT IS EXCAVATED:

$$\frac{(3144 - 175)(27)}{69,100} = 1.2 \text{ ft}$$

IF TWO FT IS EXCAVATED:

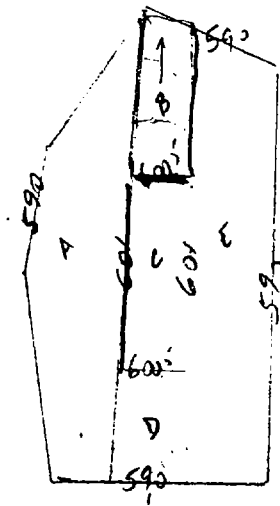
$$\frac{(5289 - 175)(27)}{69,100} = 2 \text{ ft}$$

VOLUME OF DIRT PILE :

$$V_T = V_A + V_B + V_C + V_D + V_E$$
$$= 233.3 + 107.3 y^3 + 217.1 y^3 + 87.1 y^3 + 283.3 y^3$$

$$V_T = 928.1 y^3$$

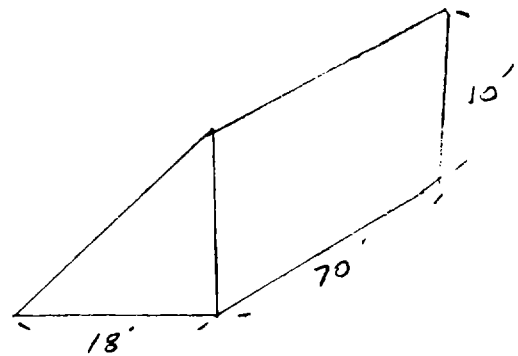
SAY 930 cy



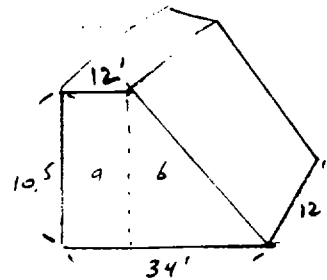
SKETCH USED TO CALCULATE VOLUME OF DIRT PILE

CALCULATE VOLUME OF EXISTING DIRT PILE

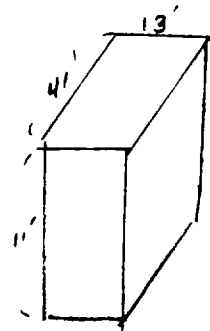
$$\begin{aligned} \textcircled{A} \quad V &= \frac{1}{2} (18' \times 10') \times 70' = \\ &= 90 f^2 \times 70' \\ &= 6,300 f^3 \\ &= 233.3 y^3 \end{aligned}$$



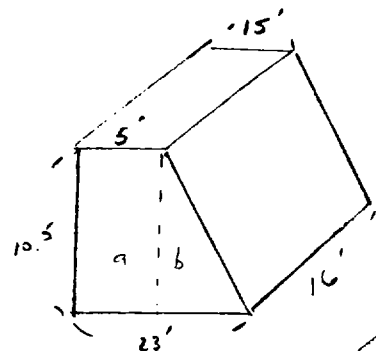
$$\begin{aligned} \textcircled{B} \quad V &= (10.5' \times 12' \times 12') + \frac{1}{2} (22') (10.5') \times 12' \\ &= 1,512 f^3 + 1,386 f^3 \\ &= 2,898 f^3 \\ &= 107.3 y^3 \end{aligned}$$



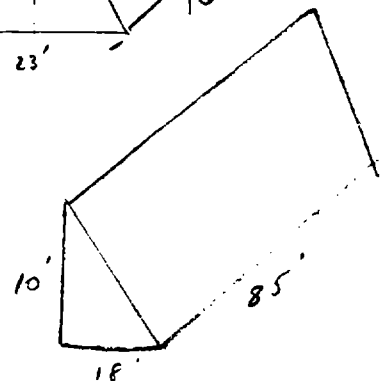
$$\begin{aligned} \textcircled{C} \quad V &= 11' \times 41' \times 13' \\ &= 5,863 f^3 \\ &= 217.1 y^3 \end{aligned}$$



$$\begin{aligned} \textcircled{D} \quad V &= (10.5' \times 5' \times 16') + \frac{1}{2} (18') (10.5') \times 16' \\ &= 840 f^3 + 1,512 f^3 \\ &= 2,352 f^3 \\ &= 87.1 y^3 \end{aligned}$$



$$\begin{aligned} \textcircled{E} \quad V &= \frac{1}{2} (18' \times 10') \times 85' \\ &= 7,650 f^3 \\ &= 283.3 y^3 \end{aligned}$$



APPENDIX C

SURTREAT TECHNICAL DATA SHEETS

TPS™ I - II - III - IV

Technical Data

TOTAL PERFORMANCE SYSTEM™

PRODUCT DESCRIPTION

TPSf "Total Performance System"™ is a water soluble, odorless, clear, non-toxic, chemically reactive, alkali silicate, non-petroleum solution that is environmentally safe and user friendly.

BASIC USE

TPS products will restore and protect all types of concrete structures. Utilizing proprietary technology, TPS can deliver a unique result by chemically changing and correcting the properties of concrete for added resistance to rebar corrosion and spalling.

TPS uses a water soluble, non-toxic, chemical formulation which penetrates and reacts with Portland cement to form a polymeric solid which will raise and control the pH to 12, inhibit corrosion, tie up corrosion-inducing chlorides, force the remaining salt to the surface, seal porosity, increase compressive strength and enhance the ability to withstand the weathering action and attack of atmospheric acids.

In order to achieve all of this, the concrete from each project is tested. This testing allows the technician to select the appropriate combination of TPS products for each project. This unique approach makes Surtreat the leader in the field of concrete restoration and protection.

REINFORCED CONCRETE DETERIORATION

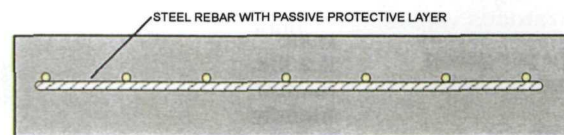
The corrosion of reinforcing steel (rebar) is the most common cause of failure in concrete structures. Steel corrosion is an oxidation process requiring the presence of air (oxygen) and moisture. Corrosion is promoted by salt and/or an acidic environment, and inhibited by an alkaline environment, and barrier coatings.

Freshly poured, low water-cement ratio concrete provides excellent protection for imbedded reinforcing steel. However, as time passes, under the influence of salts and/or atmospheric acids, cement bonds in concrete begin to deteriorate while the concrete becomes more permeable and susceptible to intrusion of contaminants and moisture. As the pH of concrete falls, electrochemical activity increases. The process perpetuates itself as oxidized rebar expands forcing concrete to crack and delaminate, encouraging more air and water penetration. Once started, rebar corrosion can not be stopped by simply waterproofing the surface of the concrete.

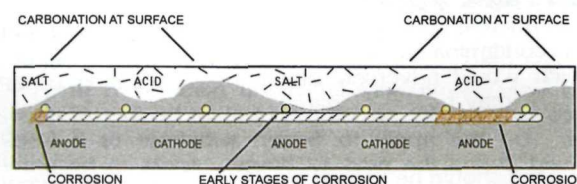
ADVANTAGES

TPS, with its superior penetrating ability, eliminates the need to remove unspalled concrete to expose embedded steel. TPS will seal, harden and stabilize Portland cement. TPS can greatly reduce or eliminate future repairs and spalling. TPS is chemically, thermally, and biologically stable, non-toxic and non-flammable. Secondary benefits include improved strength, reduced porosity and increased chemical resistance.

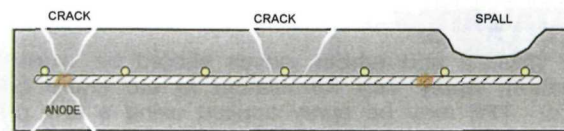
HERE'S WHAT HAPPENS



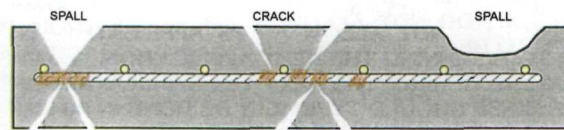
New concrete with a pH of ± 13 . Corrosion is initially inhibited by the alkaline environment of new concrete.



Time, weather, moisture, salts and acid begin to reduce the pH and corrosion begins. Electrochemical activity increases.



More time and weather further reduce the pH. Corrosion spreads causing steel expansion and concrete cracks.



Cracks allow more water, salt and acid to enter. Penetration accelerates, causing larger cracks and spalling.

THE TPS CURE:

- Remove cracked and spalled concrete to Project Engineer's Specifications.
- Apply TPS to the sides and bottom of the excavation. This will prevent or substantially slow future rebar corrosion, by raising the pH level.
- Replace and repair concrete and rebar to Project Engineer's Specification.
- Apply TPS to the new and original concrete surface. This will significantly slow or prevent future corrosion on the entire treated structure.

SURTREAT INTERNATIONAL

1360 N. Wood Dale Rd - Suite A - Wood Dale, IL - 60191
630.616.2757

PHYSICAL PROPERTIES

Physical	liquid
Color	clear
Odor	slight
Specific gravity	1.1
Flash point	none
pH	± 12
Toxicity	none
Boiling point	230°F.
Freezing temperature	32°F.
Hazardous vapors	none
Weight per gallon	9.2 lbs.
Environmentally	neutral
User	friendly
Shelf life	indefinite
Freeze harm	none
Surface bond quality	excellent
Flammability	none
V.O.C./V.O.S. content	none

SURFACE PREPARATION

The concrete surface should be structurally sound and clean of any contaminants, sealants, curing compounds, or coatings which would adversely affect the penetration of TPS. The surface may be dry or damp, but must be free of all standing water. Do not apply to frozen substrate or if freezing is expected during the next 12 hours. Areas to be patched or surfaced should be treated after loose, unbounded concrete has been removed and before actual patching or surfacing.

USAGE

Average usage, for three applications, is 100 sq. feet per gallon.

INSTALLATION

Safety glasses and rubber gloves should be worn during application. Apply TPS formulation to the entire concrete surface. TPS may be spray applied using a low pressure sprayer (garden type or equivalent) or spread over the surface with a soft bristled broom or squeegee. Make two applications, followed by a light water rinse, to facilitate penetration. Apply the third application until absorption of the TPS formulation into the concrete slab has ceased and signs of puddling occur. Spread puddling TPS evenly over entire surface. Lightly rinse down the final application with water and allow to dry overnight. **DO NOT ALLOW A TPS APPLICATION TO CURE PRIOR TO BEGINNING THE NEXT APPLICATION. TO PREVENT PREMATURE CURING, THE NEXT TPS APPLICATION OR LIGHT WATER RINSE SHOULD TYPICALLY BE DONE IN 20-30 MINUTE INTERVALS.** NOTE: Drying time due to weather conditions may shorten interval periods. Rinse concrete surface the next day to remove any unreacted TPS or purged chlorides (white residue) from the concrete surface. Unreacted TPS must be completely removed from the concrete surface prior to repair or resurfacing. Allow water to stand on the rinsed area for 10 or 15 minutes. Afterward, remove all water from the concrete surface and cavities using a broom, squeegee or sponge.

PRECAUTIONS

Protect glass surfaces. Immediately remove spills or spray mist in contact with glazing or distortion of surfaces will occur. Do not allow product to dry on glass; remove by flushing with water. Shiny aluminum may be dulled if contacted; other common metal finishes are unaffected. Do not apply to frozen substrate, or if freezing may occur within 12 hours of application.

WALLS AND STEEP SLOPES

Apply TPS as previously described, from the bottom up with fan spray pattern overlapping 20 to 30%. Typical application rates are 1 gallon per 100 square feet total, for a three-stage application.

CLEAN UP

Clean equipment using water and mild soap. Never store spray equipment without cleaning and following manufacturer's recommendations for storage between usage.

SHELF LIFE

Shelf life is indefinite provided containers are kept tightly sealed when not in use.

PACKAGING

TPS is packaged in 5 gallon containers. 55 gallon drums available upon request.

MAINTENANCE

Special maintenance of treated area is not required.

TECHNICAL SERVICES

Technical information and assistance in addition to this data can be obtained from the TPS Technical Services Department at 412-281-1202.

TEST RESULTS

Laboratory test reports from Pittsburgh testing laboratories available. Contact your local agent or call 412-281-1202.

WARNING

Avoid contact with skin or eyes. May cause irritation. If on skin, wash promptly with soap and water. Get medical attention if irritation occurs. If in eyes: rinse eyes with plenty of water for at least 15 minutes. If swallowed: Do not induce vomiting. Drink plenty of water, call physician. Misuse of empty containers can be hazardous. Do not reuse containers. Drain container completely, seal bung hole, and dispose container in a proper manner.

HAZARD INDEX

- 4 - Severe hazard
- 3 - Serious hazard
- 2 - Moderate hazard
- 1 - Slight hazard
- 0 - Minimal hazard

HEALTH

1

FLAMMABILITY

0

REACTIVITY

1

PERSONAL PROTECTION

SAFETY GLASSES & GLOVES

SURTREAT INTERNATIONAL

TPS and SURTREAT are trademarks of Surtreat International.

1360 N. Wood Dale Rd - Suite A - Wood Dale, IL - 60191
630.618.2757



TPS™ IV

Material Safety Data Sheet

SECTION I SUPPLIER INFORMATION

Common Name: SURTREAT-TPS IV
Chemical Name: Chemically-reactive, Alkali Silicate
Formula:
Supplier: SURTREAT Corp.
437 Grant Street, 1210 Frick Building
Pittsburgh, PA 15219
(412) 281 - 1202
Chem-Tel 1-800-255-3924 (24 hours)
Date Prepared: Thursday, October 07, 1999

SECTION II HAZARDOUS INGREDIENT INFORMATION

CFR 29 Part 1910.1000 Table Z-1 (July 1, 1996 issue)

Ingredient	CAS Number	PEL-OSHA (ppm)	TWA-OSHA (mg/m3)	TLV-ACGIH (ppm)	STEL-ACGIH (ppm)
------------	------------	-------------------	---------------------	--------------------	---------------------

This product contains no hazardous materials.

SECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	212 °F
Specific Gravity:	1.16
Melting Point:	N/A °F
pH:	11.5
Vapor Pressure (mm Hg):	N/A
Vapor Density (Air=1):	N/A
Evaporation Rate (Butyl Acetate = 1):	N/A
Solubility in Water:	100%
Appearance and Odor:	A clear liquid with a sweet odor.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point:	none °F
Auto-Ignition Temperature:	N/A °F
LEL:	N/A %
UEL:	N/A %
Extinguisher Media:	This material is not expected to burn.
Special Fire Fighting Procedures:	None known.
Unusual Fire and Explosion Hazards:	None known.

SECTION V REACTIVITY DATA

Stability	Stable.
Conditions and Materials to Avoid	Strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Hazardous Decomposition or By-Products	Carbon monoxide and carbon dioxide from burning.
Polymerization	None.
Conditions to Avoid	None known.

SECTION VI HEALTH HAZARD DATA

Inhalation

Acute Causes irritation to the respiratory tract.

Chronic No data available.

Eye Contact

Acute May cause irritation and stinging.

Chronic No data available.

Skin Contact

Acute: Prolonged exposure may irritate the skin.

Chronic No data available.

Ingestion

Acute May cause irritation to the esophagus and stomach.

Chronic No data available.

Medical Conditions Aggravated By Exposure

Asthma and lung diseases, skin diseases.

Chemical Listed as Carcinogen or Potential Carcinogen

No

National Toxicology Program

No

I.A.R.C. Monographs : No OSHA : No

ROUTES OF ENTRY/EMERGENCY AND FIRST AID PROCEDURES

Inhalation: Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention.

Eyes: Rinse eyes with cool water for 15 minutes. Get medical attention.

Skin: Wash off with soap and water. If irritation occurs, get medical attention. Dries to form a glassy film which can easily cut skin.

Ingestion: Drink two glasses of water and induce vomiting. Never give anything to an unconscious person. Get medical attention.

SECTION VII PRECAUTIONS FOR SAFE HANDLING AND USE

Precautions To Be Taken In Handling and Storage: Keep product from freezing. If frozen, thaw and agitate before use.

Other Precautions : None

Steps To Be Taken In Case Material Is Released Or Spilled:

Large Spills: Dike and contain for intended use.

Small Spills: Absorb on fire retardant treated sawdust.

Waste Disposal Method: Follow all Local, State, and Federal regulations.

SECTION VIII OTHER REGULATORY INFORMATION

SECTION 313 (With Chemicals Listed): This product contains the following toxic chemical(s) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR Part 372:

Ingredient	CAS Number	Weight Percent
None	NA	NA

SECTION IX SPECIAL PROTECTION & CONTROL MEASURES

RESPIRATORY PROTECTION: U.S. Bureau of Mines Respirator; self contained breathing device, airline or NIOSH approved respirator.

The specific respirator selected must be based on contamination levels in the work place, must be based on the specific operation, must not exceed the working limits of the respirator, and must be jointly approved by the National Institute of Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

VENTILATION:	Local	Exhaust	Mechanical	Special	Other
	xxx				
Protective Gloves:	Rubber				
Eye Protection:	Goggles				
Other Protective Clothing or Equipment:	None				
Work/Hygiene Practices :	Keep off of clothing				

The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data and safety information. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

APPENDIX D

CONSTRUCTION SCHEDULE

Activity ID		Description	Original Duration	Early Start	2002	2003	2004
					SEP	OCT	NOV
Master Metals-Cleveland, Ohio							
Pre-construction Activities							
0003	Preparation of Work Plan and Design Documents	0					
0005	Incorporate comments on WP and Design Documents	0					
0002	Submittal of Final Workplan & Design (Complete)	0	09/18/02 A				
0004	Customer Review of Design Documents (Complete)	0	09/18/02 A				
0006	OEPA and USEPA Document Review (Complete)	0	09/18/02 A				
0001	AOC Signed by All Parties	0	09/25/02 A				
0007	Approval of Work Plan and Design Documents	0	11/01/02 A				
0008	Pre Construction Conference	1	11/18/02 *				
2002 Activities							
0009	2002 Field Activities	12 *	11/18/02				
0010	Mobilization-Phase 1 (2002)	2	11/18/02 *				
0011	Abandon Monitoring Wells	3	11/20/02				
0017	Demolish Structures	5	11/21/02				
0019	Clean & Dispose Drums & Contents	1	11/21/02				
0013	Abandon Underground Utilities	4	12/02/02				
0021	Fill and Grade Low Areas, (Pits and Depressions)	4	12/02/02				
2003 Activities							
3019	2003 Pre Construction Meeting	0	02/25/03 *				
3009	2003 Field Activities	30 *	03/17/03				
3100	Mobilization-Phase 2 (2003)	2	03/17/03 *				
3110	Clear and Grub	2	03/19/03				
3120	Remove Site Fence & Install Temporary Fencing	1	03/21/03				
3130	Excavate and Stabilize Perimeter Soils	15	03/24/03				
3140	Offsite Disposal	8	04/07/03				
3160	Backfill, Topsoil, Seed Excavated Perimeter Area	8	04/14/03				
3170	Grade Subbase and Place asphalt	2	04/17/03 *				
3180	Refurbish Concrete	4	04/17/03				
3190	Install New Perimeter Fence	2	04/21/03				
3200	Survey	1	04/23/03				
3210	Demobilization	3	04/23/03				
Project Closeout							
0027	Preparation of O&M Plan	10	04/28/03 *				
0028	Pre-Final inspection	1	05/12/03				
0029	Pre-Final Inspection Report	1	05/26/03				
0030	Final Inspection	1	06/09/03				
0031	Final Report	1	06/30/03 *				
Start date	09/02/02	ENTACT and Associates, LLC			Early bar		
Finish date	06/27/03	Master Metals, Cleveland			Progress bar		
Data date	11/04/02	Estimated Project Schedule			Critical bar		
Run date	11/13/02				Summary bar		
Page number	1A	* Summary Activity			Progress point		
© Primavera Systems, Inc.		Note: 2003 activities could be earlier or later than shown depending on asphalt plant opening			Critical point		
					Summary point		
					Start milestone point		
					Finish milestone point		

APPENDIX E

DRAFT OPERATION AND MAINTENANCE PLAN

DRAFT OPERATION AND MAINTENANCE PLAN
FOR
MASTER METALS, INC. SITE
CLEVELAND, OHIO

PREPARED BY:
ENTACT & Associates, LLC
Wood Dale, Illinois.

November, 2001

**Draft Operation & Maintenance Plan
Former Master Metals Site
Cleveland, Ohio**

Table of Contents

1.0	PURPOSE AND OBJECTIVES	3
2.0	SITE BACKGROUND	4
2.1	SITE LOCATION	4
2.2	SITE DESCRIPTION	4
3.0	OPERATIONS AND MAINTENANCE PLAN	5
3.1	COVER INSPECTION	5
3.2	PERIMETER FENCE MAINTENANCE	5
4.0	REPORTING	6

List of Attachments:

- I Site Features
- II O&M Inspection Log and Example

1.0 PURPOSE AND OBJECTIVES

This Operations and Maintenance (O&M) Plan has been prepared for the Master Metals, Inc. (MMI) site, in Cleveland, Ohio, by ENTACT & Associates, Inc. (ENTACT) on behalf of the Respondents to the Administrative Order of Consent (AOC), Docket No. VW-'02-C-711, for implementation by Northern Ohio Lumber & Timber Company (NOLTCO). This intent of this plan is to provide for the post-remediation activities for the MMI site, in accordance with the AOC and Statement of Work (SOW).

The purpose of the O&M plan is to provide for the necessary maintenance of the remediated property that is essential in maintaining the long-term effectiveness of the implemented remedy. The remedy for the site included the following key components:

- Demolition of the former facility structures with the exception of the roundhouse and removal off all lead-impacted materials (including soils not covered with concrete) on property as part of a Phase I time critical removal (TCR) action;
- Placement of an asphalt cover over the southern portion of the site where the existing concrete was in poor conditions;
- Excavation and stabilization of all lead-impacted perimeter soils outside asphalt or concrete areas that exceeded the performance standards of 1,000 mg/Kg, or until historic slag was encountered, for either placement in low areas on property to be covered with an asphalt cover or disposed of off-site at an approved landfill as nonhazardous waste;
- Backfilling with clean fill and restoration of excavated areas not covered with concrete or asphalt;
- Repair and sealing of the "non-asphalted" concrete cover;

The necessary operation or maintenance necessary to assure the remedy remains effective over time, include the following:

- Routine inspection and repair, as needed, to maintain the integrity of the asphalt and concrete covers; and
- Routine inspection and repair, as needed, of the 6-foot perimeter fence to ensure that access to the site is controlled;

This document presents the following:

- ♦ **Section 1.0:** Purpose and objectives of the O&M activities;
- ♦ **Section 2.0:** Site background;
- ♦ **Section 3.0:** Description of the O&M Plan including scope and frequency of inspections, and identification and performance of necessary repairs;
- ♦ **Section 4.0:** Reporting requirements.

2.0 SITE BACKGROUND

2.1 SITE LOCATION

The MMI Superfund Site (the "Site") covered under the AOC includes the former MMI lead facility (the "Facility") located at 2850 West Third Street, Cleveland, Cuyahoga County, Ohio. The Site is situated in Township 7 North, Range 12 West, Section 17, ¼ NE, ¼ SW, ¼ SW, with coordinates obtained from the Facility Index System (FINDS) listed as 41 degrees, 28 minutes, 26 seconds latitude and -81 degrees, 40 minutes, 31 seconds longitude. The site location and features are illustrated in Attachment I of this Plan.

2.2 SITE DESCRIPTION AND FACILITY HISTORY

The MMI property is a triangular-shaped parcel encompassing approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The site is bordered on the west by rail yards owned by the Baltimore & Ohio (B&O) Railroad, the east by West Third Street and B&O railroad tracks, and on the south by a dead-end road and an abandoned industrial property. LTV Steel owns the property to the south and east.

The facility was constructed in 1932 on slag fill by NL Industries, Inc. (formerly National Lead) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. In 1979, the facility was purchased from NL Industries by MMI who continued to operate the secondary lead smelter (USEPA, 2001a).

On August 5, 1993, as a result of RCFA violations, the OEPA Director ordered MMI to cease operating the facility until it could demonstrate compliance (USEPA, 2001a). Operations never did resume at the MMI facility and Bank One of Ohio took possession of all MMI cash collateral and accounts receivable. The current property owner remains MMI. The former facility president, Mr. Douglas Mickey, is deceased (USEPA, 2001a).

3.0 OPERATIONS AND MAINTENANCE PLAN

The O&M Plan has been designed to include all necessary tasks that will be required to maintain the effectiveness of the remedy. The primary focus of the O&M Plan is to provide the necessary inspections and repairs needed to maintain the integrity of the asphalt and concrete covers and maintenance of the fence to control site access. Inspections will be conducted on an annual basis and the results of the field inspection recorded on the field inspection form included in Attachment II.

3.1 COVER INSPECTION

Inspection of the concrete and asphalt covers will include an annual visual inspection of the entire area (i.e. asphalt and concrete) for significant cracks or fissures, presence of vegetation, and signs of crumbling or other deterioration of the surface. The annual inspection should be performed in late May in order to promptly address any noted deficiencies in the cover or concrete areas.

Significant cracks are defined as fully penetrating the existing concrete surface with a width greater than one-half inch. Any repair that is observed to be necessary as a result of the inspection will be performed as soon as possible in general accordance with ODOT Specification 256.

3.2 PERIMETER FENCE MAINTENANCE

The 6-foot-high chain link perimeter fence will be inspected annually to ensure that site access is restricted and gates remained locked during non-business hours. The fencing will be inspected to determine if there are any breaches, holes, erosion rills or animal burrows beneath the fence. Access gates will be inspected and maintained including oiling the hinges and replacing worn closure/lock mechanism. Any necessary repairs will be completed as soon as practicable following the inspection.

4.0 REPORTING

A report describing the results of the inspections and details of any required repairs and maintenance activities will be submitted to the EPA within seven calendar days after completion of the inspection.

The report will contain the following:

- Inspector's name, title and date of the inspection;
- A brief narrative of the inspection results including the completed inspection form;
- A description of any maintenance activities that are completed or planned;
- A detailed discussion of all required repairs needed to maintain the integrity of the cover and fence at the site;
- Schedule for follow up activities;
- Photographic documentation as warranted.

**Form for Master Metal Inc. Cleveland, Ohio Site
O & M Inspection Log**

Inspector's Name/Company Affiliation: _____ Date of Inspection: _____
 Signature: _____

Site Structure	Inspected (Yes/No)	Inspection Observations	Maintenance Work Required or Performed	Completed (Yes/No)	Date Completed
Security Fence:					
• Gates/locks secure and operative					
• Evidence of deterioration					
• Evidence of unauthorized entry					
• Burrowing or tunneling under fence					
• Damaged barbed wire					
• Comments					
Asphalt Cover – Integrity					
• Evidence of broken asphalt or fissures					
• Indicate areal extent and location					
• Comments					
Concrete Cover – Integrity					
• Evidence of crack, presence of vegetation, crumbling					
• Indicate areal extent and location					
• Comments					

EXAMPLE

Former Master Metals Inc. Cleveland, Ohio Site O & M Inspection Log

Inspector's Name/Company Affiliation: John Doe / NOLTCO Date of Inspection: July 2, 2003
Signature: _____

Site Structure	Inspected (Yes/No)	Inspection Observations	Maintenance Work Required or Performed	Completed (Yes/No)	Date Completed
Security Fence:					
• Gates/locks secure and operative	Yes	Secure and operative	None	N/A	N/A
• Evidence of deterioration	Yes	Loose corner on gate	Fencing reattached	Yes	7/2/03
• Evidence of unauthorized entry	Yes	Site secure	None	N/A	N/A
• Burrowing or tunneling under fence	Yes	No burrowing or tunneling	None	N/A	N/A
• Damaged barbed wire	Yes	Barbed wire intact	None	N/A	N/A
• Comments		None			
Asphalt Cover – Integrity					
• Evidence of broken asphalt or fissures	Yes	Deteriorated asphalt near storage Bldg. A			
• Indicate areal extent and location	Yes	3 square feet; see attached drawing and photos	Repair asphalt	No	8/2/03
• Comments					
Concrete Cover – Integrity					
• Evidence of crack, presence of vegetation, crumbling	Yes	Integrity good	None	N/A	N/A
• Indicate areal extent and location	Yes	N/A	None	N/A	N/A
• Comments					

ATTACHMENT I
SITE FEATURES

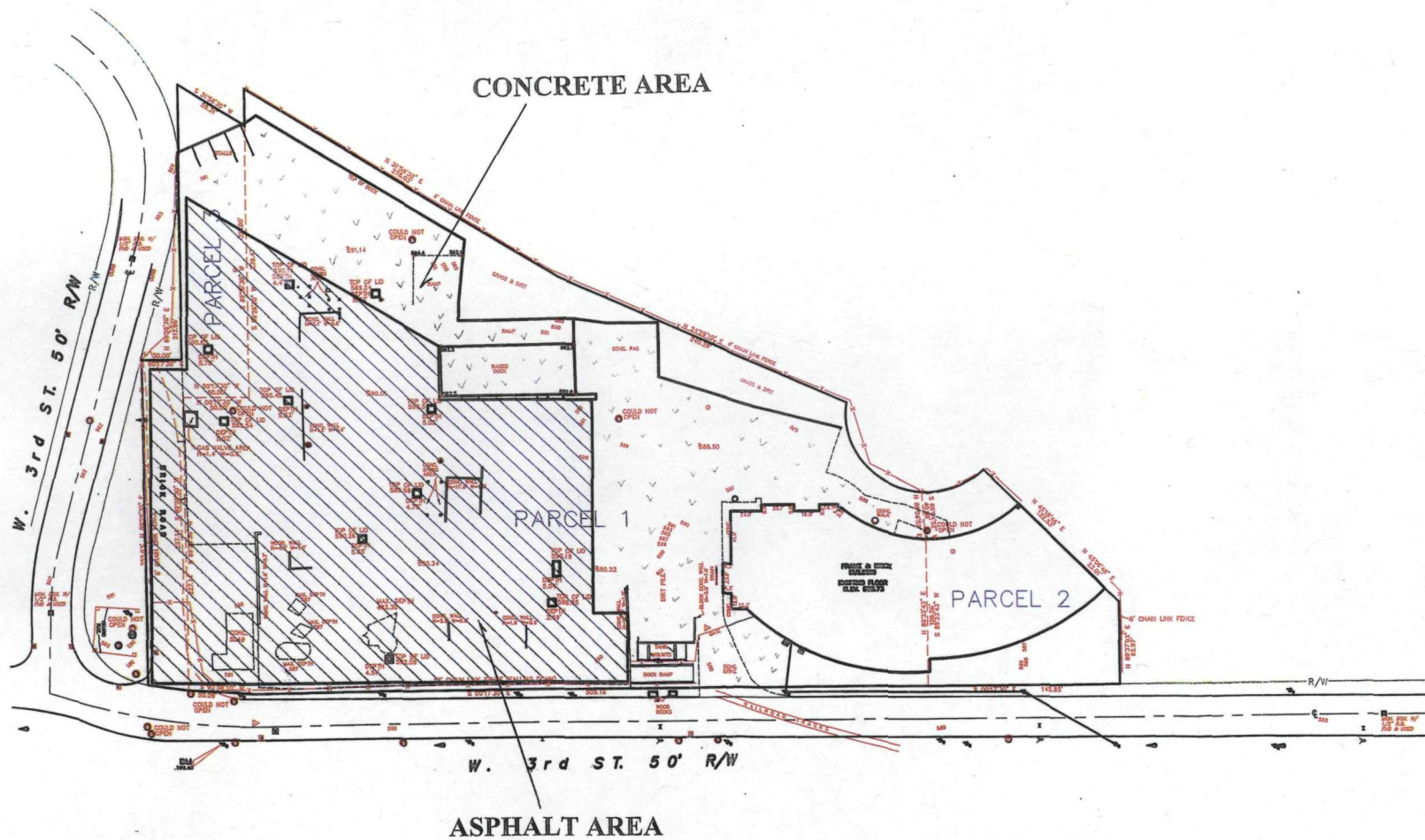


Figure 1

CONCRETE AND ASPHALT DELINEATION AREAS
Master Metals Superfund Site
Cleveland, Ohio

ENTACT & Associates LLC
Wood Dale, Illinois

Date: January 2003

Scale: 1 inch = 90 feet

Checked By: PAV

Source: Campbell & Associates Survey Map

ATTACHMENT II
O&M INSPECTION LOG AND EXAMPLE

EXAMPLE

Former Master Metals Inc. Cleveland, Ohio Site O & M Inspection Log

Inspector's Name: John Doe

Date of Inspection: July 2, 2003

Site Structure	Inspected (Yes/No)	Inspection Observations	Maintenance Work Required or Performed	Completed (Yes/No)	Date Completed
Security Fence:					
• Gates/locks secure and operative	Yes	Secure and operative	None	N/A	N/A
• Evidence of deterioration	Yes	Loose corner on gate	Fencing reattached	Yes	7/2/03
• Evidence of unauthorized entry	Yes	Site secure	None	N/A	N/A
• Burrowing or tunneling under fence	Yes	No burrowing or tunneling	None	N/A	N/A
• Damaged barbed wire	Yes	Barbed wire intact	None	N/A	N/A
• Comments		None			
Asphalt Cover – Integrity					
• Evidence of broken asphalt or fissures	Yes	Deteriorated asphalt near storage Bldg. A			
• Indicate areal extent and location	Yes	3 square feet; see attached drawing and photos	Repair asphalt	No	8/2/03
• Comments					
Concrete Cover – Integrity					
• Evidence of crack, presence of vegetation, crumbling	Yes	Integrity good	None	N/A	N/A
• Indicate areal extent and location	Yes	N/A	None	N/A	N/A
• Comments					

**Former Master Metals Inc. Cleveland, Ohio Site
O & M Inspection Log**

Inspector's Name: _____

Date of Inspection: _____

Site Structure	Inspected (Yes/No)	Inspection Observations	Maintenance Work Required or Performed	Completed (Yes/No)	Date Completed
Security Fence:					
• Gates/locks secure and operative					
• Evidence of deterioration					
• Evidence of unauthorized entry					
• Burrowing or tunneling under fence					
• Damaged barbed wire					
• Comments					
Asphalt Cover – Integrity					
• Evidence of broken asphalt or fissures					
• Indicate areal extent and location					
• Comments					
Concrete Cover – Integrity					
• Evidence of crack, presence of vegetation, crumbling					
• Indicate areal extent and location					
• Comments					